COMMUNICATIONS

TO THE

BOARD OF AGRICULTURE;

ON SUBJECTS RELATIVE TO

THE HUSBANDRY,

AND

INTERNAL IMPROVEMENT

OF THE COUNTRY.

VOL. I.

Omnium rerum, ex quibus aliquid acquiritur, nihil est agricultura melius, nihil uberius, nihil dulcius, nihil homine libero dignius. CIC. DE OFFIC. I. C. 42.

PARTS I. AND II.

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ADVERTISEMENT.

THIS, being the first Specimen, printed by the Board of Agriculture, of the various Communications which it has received, respecting some, of the many important subjects, to which its attention has been directed, it may not be improper, briefly to explain, the design of the work, and the circumstances which have led to its publication.

The first object of the Board undoubtedly was, to ascertain the real situation of the country, and the means of its improvement. With that view, the County Reports were originally set on foot; and as soon as they are completed in a corrected form, the Board will be enabled to lay before Parliament, a General View of the Agricultural State of the Kingdom. It is not improbable, that a special Report of that nature, so far as regards Scotland alone, may soon be ready.

In addition, however, to those local or general Reports, it was extremely desirable, that the vast mass of information and experimental knowledge, which exists in this country, on all agricultural subjects, should be collected, and brought into some regular system. Though that system could not be at once complete, yet it would lead to perfection.* When the foundation of a digested system is once laid, the accumulation of improvement is rapid. But it is necessary to ascertain what is already known, before it is possible to judge what is wanting. It is therefore proposed, to print together in one paper, any communications sent to the Board, on each particular subject; from the consideration of which, a Committee of its Members, may be enabled to form the whole into a regular system.

To exemplify this plan, it may be observed, that several distinct communications, having been transmitted to the Board, on *Farm Buildings*, and the accommodations necessary for the husbandmen; they are now collected together, and printed in Part I. of this publication. From them,—from the information on the same subject contained

* Were all the information which now exists in Great Britain, on agricultural subjects, collected and systematized, there is every reason to believe, that it would approach very near to perfection; some questions regarding manures alone excepted, which the inquiries now going forward, and the experiments recommended by Dr. Fordyce, now about to be tried, will go a great way to determine.

in the *County Reports*,—from the experience of the Members of the Board,—and the additional communications of its many zealous and public spirited correspondents, joined to the information which might be collected from the numerous volumes already written on topics of that nature, there can be no doubt, that a paper may be drawn up on Farm Buildings, which would probably render any farther discussion, or additional publication on that branch of husbandry, unnecessary.

By following the same plan, with regard to other agricultural subjects, the whole, will, in process of time, be so thoroughly investigated, that agriculture will necessarily become, the best understood, and the most accessible, of any art, in the whole circle of human acquirement.

The reader will have the goodness to remember, that the Board is not responsible, for any fact or observation contained in the following papers, as they are printed in the manner in which they were transmitted by their respective authors, unless where different subjects happened to be intermixed in the same communication.

PRELIMINARY OBSERVATIONS

ON THE

ORIGIN OF THE BOARD OF AGRICULTURE,

And its Progress for Three Years after its Establishment.

BY THE PRESIDENT OF THE BOARD.

THE circumstances which led to the Establishment of a Board, so likely to be of material service, both to this country, and to society at large, cannot fail to be interesting, not only to the Members of that Board, but to the Public. It appears, therefore, a duty incumbent on the person by whom that institution was proposed, to draw up a brief account of the various circumstances which contributed to its formation, whilst they continue in his remembrance. To trace the steps whence useful establishments originated, is at all times desirable and useful, but it is, perhaps, necessary on the present occasion, as some have supposed, that the idea of such a Board was borrowed from this or that author, who incidentally might have previously suggested plans of a similar kind. Had it been so, I should have readily acknowledged it; for the difficulty attending such an attempt, is, not to propose a plan, but to carry it into execution.* It may be sufficient, however, to declare, that I knew nothing of such a measure having been recommended by any other individual, previously to its having been proposed by myself. Indeed, from the following narrative, the reader

* In modern times, it is impossible to claim any particular merit from such suggestions; for all *Societies* instituted for the improvement of any particular branch of science, are merely extensions of the idea, which was carried into effect, when the Royal Society was instituted in 1662; and all *Boards*, are derived from the Board of Trade, established in the reign of King William.

will easily perceive, that such an idea would naturally have occurred to the person who moved it in parliament, independently of any suggestion from others.

In the year 1786, I undertook an extensive journey through the northern, and, with respect to useful information, undoubtedly the most interesting part of Europe. The object of that tour was, to obtain political knowledge, to ascertain the state of other countries, and to discover every means, which had been sanctioned by the experience of other nations, that could be successfully introduced for the improvement of Great Britain. In the course of that tour, I became acquainted with the most distinguished authors, the ablest statesmen, and the most zealous patriots, that Europe could then boast of. I returned, full of ardour, to establish, in my own country, all the beneficial institutions which were scattered over others; and to make this island, the centre of the various improvements, of which political society was capable, more especially those of an agricultural nature, to which a person possessed of landed property is naturally partial. But circumstances, on which it is unnecessary now to dwell, having occasioned a coldness with the Minister, I found that any attempt to carry such measures into effect, was not likely to be successful in parliament, and thence was under the disagreeable necessity, of giving up such ideas for a time, and of waiting for a more favourable period to bring them forward.

As, however, in the course of my tour, I necessarily collected a variety of useful hints, and was enabled to ascertain, that much might be effected by the exertions of one man, if uninterruptedly devoted to any particular object;* as in the course of that tour, I found the superior importance of agricultural pursuits, the great character which England had acquired for knowledge in that art, and the expectations which were entertained that

* It was this circumstance which induced me, from the beginning, to carry on the business of the Board, on a greater scale than otherwise I should have attempted, and which to any other person, not possessed of equal experience in conducting political inquiries, would have been deemed impracticable.

it would be peculiarly improved in this country, universally admitted; and as the extent of the tour, and the rapidity with which it was executed, renders it at any rate an event worthy of preservation, I have taken the liberty of annexing in Appendix (A) to these Preliminary Observations, a map drawn up after my return to England, in which that journey was sketched out.

The next circumstance which led to the establishment of this institution, was the following.

In the year 1790, I laid before the public, the second volume of the History of the Public Revenue of the British Empire. I had intended, as appears from the advertisement prefixed to that work, to have concluded it with a chapter on the political circumstances of the country; but after taking every possible pains to become master of the subject, all the information I could obtain, was so extremely defective, that it was necessary to give up the idea; and I then saw the necessity of forming the plan of some institution, for the express purpose of collecting useful political information, the public at large having felt the most serious inconveniences and losses, from information of that nature, not being any where to be obtained.

Soon after the publication of that work, I visited Scotland. It happened to be about the meeting of the General Assembly of the Clergy of that country, of which assembly I was a member,* and with the leaders of which I lived in terms of intimacy and friendship. It fortunately occurred to me, that I might prevail upon that respectable body, to furnish such information, respecting the general state of the northern part of the kingdom, as might enable me to give a sufficient idea of the political situation of that part of the British empire. I was thence induced to begin that extensive undertaking, the Statistical Account of

* Laymen, under the name of elders, or ruling elders, are admitted members of the clerical judicatures in Scotland; by far the best means of establishing that union so often talked of between church and state.

Scotland, now about to be concluded in 20 volumes octavo. It is a work, concerning which it is only necessary to observe, that towards its completion, NINE HUNDRED individuals of intelligence and ability, have contributed their assistance.

About the time that work commenced, I had occasion to consult with some of the clergy and the proprietors of the Shetland islands, who happened then to be at Edinburgh, respecting the best mode of procuring information from that part of the kingdom, and heard such accounts of the celebrated wool of that country, and received such information respecting the danger to which their flocks were exposed, from an infectious disorder which had got into their islands, that I resolved to bring the state of the sheep and wool of the Shetland islands before the Highland Society. That respectable institution acknowledged the importance of the subject, and gave every possible assistance in prosecuting the necessary inquiries regarding it. But finding that the funds of that Society were too confined, for carrying on any measure on a great scale, for the safety of that sort of sheep, or the improvement of the other breeds in the kingdom, more especially as it had a great variety of other objects to which it was bound to direct its attention, I saw the necessity, of erecting a new institution, for the special purpose of improving British wool; in which attempt I fortunately succeeded.

The business of the British Wool Society, was carried on with considerable energy and success. It would be tedious here to narrate the particulars. They are to be found in Appendix, No. 3. of the corrected Report of Mid-Lothian. In conducting the affairs of that Society, I received additional experience, to that which I had already acquired from the Statistical Account of Scotland, of the many important advantages to be derived, by procuring accurate reports respecting particular districts. The state of the sheep-farming in the northern parts of Scotland, was ascertained in the course of a tour made by Mr. Andrew Kerr, in 1791; and in 1792, some intelligent persons, residing on the borders of the two king-

doms, were sent to survey the manner in which the farmers in England managed their flocks. When the account of their tour was published, I thought it necessary to prefix some ideas on the means of improving British wool in general; and on that occasion, for the first time, ventured, in the following words, to hint at the establishment of a Board of Agriculture.

" The British Wool Society, by calling the attention of the public, to " the improvement of this important article, have certainly done much ser- " vice to their country. Under their patronage, the greater part of the " island has been surveyed, by persons skilled in the management of sheep, " whose observations they are circulating over the kingdom. They have " established many important facts; they have proved, that the finest " breeds of Spain, or of England, will thrive in the wildest of the Cheviot " hills, and that very fine woolled breeds may be propagated in the most " mountainous districts of Scotland.—But unless this object is thought wor- " thy of public attention and encouragement,—UNLESS A BOARD OF " AGRICULTURE IS CONSTITUTED, for the sole purpose of super- " intending the improvement of the sheep and wool of the country, and " other objects connected, either with the cultivation or with the pasturage " of the soil, the exertions of any private society must soon slacken, and its " labours become useless and inefficient; whereas, under the protection of " the government of the country, and the superintendance of such a Board, " properly constituted, (more especially if formed of persons, who *gra-* " *tuitously* devoted their services, to promote such valuable and truly " national interests,) every field would soon be cultivated to the best " advantage, and every species of stock would soon be brought to their " greatest possible perfection."

Fully impressed with the peculiar importance of the institution thus hinted at, and resolved to wait no longer in the expectation of a more favourable period to propose it, I came up to London in December 1792, determined either to succeed in the attempt, or if unsuccessful, to aban-

don political pursuits, and to devote myself entirely, in future, to the improvement of my own private estate.*

Being at that time in opposition to the Minister, the prospect of succeeding was not very promising. Several incidents, however, which it is unnecessary now to mention, contributed to its success: the assistance of Mr. Secretary Dundas in particular, was extremely material, who, notwithstanding our political differences, was always well disposed to promote any measures I brought forward, which might appear beneficial to the public. The first sum I required was £10,500; but I afterwards found it necessary to reduce it to £5,500, and at last so low as £2,500. The annual income, however, was at last finally settled at £3000. In Appendix B, the reader will find the copy of a printed paper, which was circulated among the Members of the House of Commons previous to the motion coming on,

* I began the attempt with little hopes of success, but with a resolution to try every possible chance of obtaining the object. Little encouragement was given to persevere in it, by those to whom I first mentioned the plan. Mr. Arthur Young in particular assured me, it would be vain to attempt it; and jocosely betted a complete set of his Annals of Agriculture, against another set of my Statistical Account of Scotland, (a natural enough kind of wager between two literary men,) that it would not succeed. Having accidentally informed Mr. Young, in the course of a letter to him, that I had an appointment with Mr. Pitt, to explain to that Minister the advantages of the proposed measure, that he would certainly lose his Annals, and that he ought to send them to the binder's; in his answer, dated 10th January, 1793, he says, "you are going to Mr. Pitt, and I am to lose the wager: when you come from Mr. "Pitt, I shall have won it. Pray don't give ministers more credit than they deserve. In ma- "nufactures and commerce you may bet securely; but they never did, and never will do any "thing for the plough. Your Board of Agriculture will be in the moon. If on earth, remem- "ber I am to be Secretary." I mention this incident, principally with a view of rescuing this active and valuable friend to the agriculture of his country, from an imputation, that he had sacrificed his political principles, for the sake of the emoluments attached to the situation of Secretary to the new Board. In the first place, till the address passed the House of Commons in May 1793, he did not believe that such an institution would ever have taken place; and, in the second place, if such a plan should unexpectedly succeed, he applied for the office in question, not to the Minister, but to a private friend, on whom the nomination of Secretary to his own Board, would necessarily devolve. No member of the administration, indeed, interfered in the nomination of any one of the officers.

which I have thought it necessary to preserve, it being the first rough sketch of the plan, and the reader might, perhaps, be desirous of comparing it with the future establishment of the Board.

It was on the 15th of May, 1793, that the motion for an Address to the Crown, recommending such an institution, was made in Parliament. The substance of the speech made upon the occasion will be found in Appendix (C). The Chancellor of the Exchequer (Mr. Pitt) immediately before I rose, informed me, that he would not oppose the measure, but that his support would depend on what he judged was the sense and feelings of the House upon the occasion; which seemed so decidedly in its favour, that he determined to assist in carrying it through. A few members in opposition, imagining that some deep plot of the Minister's, or some scheme of corruption or influence was at the bottom, resisted it with great vehemence; and from dislike to new schemes, or prejudice against any thing the Government seemed to countenance, would have strangled a measure in its birth, which has already so materially contributed to preserve the nation from the horrors of famine, and will be the means of rapidly increasing its agricultural industry and treasures.* On the first night it was proposed, the House happened to be extremely thin before the business came on, and was actually counted out in consequence of 40 members, (the number necessary when a question is to be determined by a division) not being present. The debate was then adjourned till the 17th of May; and after a discussion, in the course of which many respectable gentlemen spoke in its favour, it was carried, on a division, by a majority of 75; 101 voting for it, and 26 against it. It would be injustice to the Minister not to acknowledge, that all my efforts would have been fruitless, had he not latterly exerted both his influence and his talents in support of the measure.

* Mr. Sheridan, and some others, who originally opposed it, have since very handsomely expressed their conviction of the utility of the measure, and a wish to see the Board put on a respectable footing.

The motion thus carried, was expressed in the following terms:

"That an humble Address be presented to his Majesty, entreating that "his Majesty would be graciously pleased, to take into his royal conside- "ration, the advantages which might be derived by the public, from the "establishment of a Board of Agriculture, and internal improvement.

"Humbly representing to his Majesty, that though in some particular "districts, improved methods of cultivating the soil are practised, yet "that, in the greatest part of these kingdoms, the principles of agri- "culture are not yet sufficiently understood, nor are the implements of "husbandry, or the stock of the farmer, brought to that perfection of "which they are capable.

"That his faithful Commons are persuaded, if such an institution "were to take place, that such inquiries might be made into the inter- "nal state of the country, and a spirit of improvement so effectually "encouraged, as must naturally tend to produce many important national "benefits, the attainment of which his Majesty has ever shewn a most "gracious disposition to promote; and in particular, that such a measure "might be the means of uniting a judicious system of husbandry, to the "advantages of domestic manufacturing industry, and the benefits of "foreign commerce, and consequently of establishing, on the surest and "best foundations, the prosperity of his kingdoms.

"And if his Majesty shall be pleased to direct the institution of such "a Board, for a limited time, to assure his Majesty, that his faithful "Commons will cheerfully defray any expence attending the same, to "the amount of a sum not exceeding £.3000."

The difficulties, however, attending the formation of such an establish- ment, instead of being surmounted, had hardly yet begun. I had occasion to make an excursion to Scotland after the motion was carried, but returned in June, full of expectation, that in the space of a few days the Board might be assembled. Yet, though every possible exertion was made, the charter, a copy of which will be found in Appendix (D), was not drawn up, and

ultimately sanctioned by the authority of the Great Seal, till the 23d of August; and it was on the 4th of September following, before the Board could be assembled.* The reader will find in Appendix (E), the address that was pronounced on that day; in which the measures recommended to the attention of the new institution, and which have since been pursued, are chalked out. It may not be improper to add, that our regular sittings did not commence till the 23d of January following, only one meeting, for the purpose of constituting the Board, having been held in 1793. Hitherto, therefore, only three sessions have taken place.

By the original plan (see Appendix B), it was proposed, that £.500 per annum should be expended in collecting materials for a Statistical Account of England. Specimens of Parochial Reports, exhibiting the progress of political society, from the pastoral state, to that of luxury and refinement, which were intended to furnish examples of the proper mode of drawing up such accounts, in districts of every description, were actually printed, with a view of being sent to the clergymen of every parish in England, and an address, explaining the nature and principles of statistical philosophy, was prefixed to those specimens, with a view of rousing the Clergy of the Church of England, to an exertion similar to that of their brethren in Scotland. As it is proper to preserve the hints contained in that address, in case such a measure should be resumed, I have inserted both it, and the papers and tables which accompanied it, in Appendix (F). The specimens alluded to, are particularly mentioned in that part of the Appendix, and are to be found in the Statistical Account of Scotland.

But after every measure was thus prepared, for carrying on the Statistical Account of England, with the greatest possible energy and spirit, I found it necessary to alter the plan. The want of the privilege of frank-

* In the course of that tiresome interval, I was often on the brink of giving up the attempt; and nothing but a spirit of perseverance, which could not easily be damped, prevented me from relinquishing it.

ing, the impossibility of conveying papers by any other medium but the post, to every parish of the kingdom, and doubts how far the public might at first approve of such inquiries, until they had been accustomed to them, and had felt the benefits to be derived from investigations of that nature, all contributed to decide in favour of *general*, instead of *minute and particular*, inquiries. I was therefore under the necessity of recommending, in the address above alluded to, *County*, instead of *Parochial* Reports. The plan drawn up for the County Reports, will be found in Appendix G; and in Appendix H, a statement of the manner in which the surveys were arranged. It is singular that such an undertaking should have been attempted by one man,* the Board having delegated to its President the whole charge of those surveys; but it was owing to the following peculiar circumstance—Being possessed of property in the most remote province of this island, (the county of Caithness) where I occasionally reside, I am under the necessity of traversing a great part of the kingdom in my way to and from the metropolis, and must necessarily be acquainted, with a greater variety of individuals, than falls to the lot of almost any other person; and thence I found little difficulty, in nominating persons, capable of giving an account of the husbandry of every part of the kingdom. This was extremely material, in conducting a business, where the improvement of the whole, and not the partial benefit of any particular district, was in contemplation. Besides, a complete view of every part of a kingdom is desirable, because there is no spot in it, which is not entitled to attention, and from which some useful hints may not be obtained.

In appointing persons for the purpose of drawing up the Surveys in question, I was extremely desirous of having as great a variety as possible, in order that no branch of husbandry might be neglected, and that the subject might be viewed in every possible light. Many of those who

* The correspondence respecting these surveys was particularly extensive. Several thousand letters were written on the occasion.

were nominated on the occasion having undertaken the task gratuitously, and all of them being satisfied with little more than the bare payment of their expences, the whole charge of collecting the great mass of information contained in the original Reports, has not exceeded the inconsiderable sum of about £. 2170. The principal expence was that of printing, it being proposed to give copies of the Reports to every member of the two Houses who applied for them. The number of which, however, having soon increased to 501, namely, 375 Commoners and 126 Peers, the expence amounted to a sum far exceeding the narrow income with which the Board was intrusted, consequently it became necessary to require a subscription of ten guineas from those who wished for the Reports. That the public however may see, how the money given to the Board has been expended, an account of it will be found in Appendix I, so far as it has hitherto been received.

With regard to the progress of the institution, after it was thus constituted, it may be sufficient to refer the reader to the Addresses printed in the Appendix, K, L, and M, in which I have endeavoured, briefly to state, the measures which have been taken, in the course of each session. From the perusal of those papers, it will appear, how great a variety of articles were attended to, and how much important business was gone through, within a very limited period.

The original sketches of the County Reports, with only two exceptions, now in the press, are already completed, and even the corrected Reports are at this time in a state of considerable forwardness. But were all the County Reports reprinted, and even the General Report on the Agricultural State of the Kingdom, laid before Parliament, only a small part of the original plan will have been executed. According to that plan, every thing that regarded, not only the Agriculture, but *the internal improvement* of the country, was included in the proposed establishment. The object was, first to collect, and then to condense and systematize, every particle of information respecting any point that

could be interesting, either to individuals or to society.* It would not then be difficult, for any set of rulers, to know, how the happiness of the people they governed, could best be secured: nor would it be impossible, in a great measure, to realize, those schemes of public felicity, with the expectation of which, a neighbouring nation has hitherto been amused.

But were it restricted to agriculture alone, its importance to this country, at this time, is hardly to be questioned, more especially as from the magnitude of our debts and expences, an increased, and increasing revenue, is so essentially necessary. When the principles of improved husbandry are once clearly ascertained (which will soon be effected by the exertions of the Board), and when, by wise laws, every obstacle to improvement shall be removed, the farmer will then be enabled to raise, at less expence, a much greater quantity of provisions, and consequently will have it in his power, without injury to himself, to sell them at a lower rate to the public.

The people having thus the necessaries of life cheaper, must be better satisfied with the government under which they live than otherwise they would be, and must have more money to lay out on superfluities, the taxes on which are the principal sources of the public revenue.

Hence, both the peace and quiet of the country, and the resources of the state, depend, upon the progress of our agricultural improvements. By them, the industrious and skilful farmer, instead of being injured, may be enriched, though provisions may be cheap and abundant; whilst the public at large, and the Exchequer in particular, reap all the advantages to be derived from the greater plenty, and consequently from the comparative cheapness of provisions, and, what must prove the necessary result of both, the general prosperity of the nation.

It is on this day precisely three years, since the Board of Agriculture first assembled. The labour which it has since been necessary to undergo,

* See Appendix (N), for a farther explanation of the objects of the Board.

and the difficulties which have since been surmounted, the reader will easily perceive, must have been extremely considerable, in conducting a new and extensive undertaking. I have hitherto been enabled to preside over the business of the Board, with some degree of satisfaction and success, and my utmost ambition is, to see it put in such a train, that it will be almost impossible for any person who may succeed in that situation, to render so valuable an institution, either mischievous, or useless.

I cannot conclude, without offering my best acknowledgments to the many respectable Members, who have assisted me in the management of so important an establishment. To their zeal, exertions, and public spirit, the success of the Board, and the character it has acquired, must be attributed. Whilst they continue to honour it with their support, it cannot fail to prove a blessing to their own country, and an example to others.

JOHN SINCLAIR.

Board of Agriculture,
4th Sept. 1796.

SKETCH

of SIR JOHN SINCLAIR'S JOURNEY through the Northern Parts of EUROPE.

ABSTRACT of the JOURNEY.

1786	*May*	29	*Left*	**LONDON**	*September*	23	*arrived at* **Kiew**
		30	*Embarked at*	**Gravesend**	*October*	4	*at* **Warsaw**
	June	16	*Landed at*	**Gottenburgh**		17	*at* **Vienna**
		22	*Arrived at*	**Copenhagen**	*November*	8	*at* **Berlin**
	July	11	*at*	**Stockholm**	*December*	5	*at* **Amsterdam**
	August	1	*at*	**Riga**		23	*at* **Brufsells**
		8	*at*	**Petersburgh**		29	*at* **Paris**
	September	10	*at*	**Moscow**	1787 *January*	16	*at* **LONDON**

In all about seven months and a half.

The Journey amounts to 7500 English miles, or 33 miles a day. However short the time may appear, yet it is certainly possible, by great activity and perseverance, even in seven or eight months, to see the objects the best intitled to attention, and the persons the most distinguished for their power, their beauty, or their talents, in the greater, & (what is justly accounted) the most interesting part of Europe.

Neele sculp.r 352 Strand.

APPENDIX. B.

Plan for establishing a Board of Agriculture and internal Improvement.

Originally printed in May, 1793.

It has long been justly complained of, that, whilst every attention has been paid to *trade*, and every encouragement given to *commercial industry*, Agriculture has been totally neglected; though, at the same time, it is hardly necessary to observe, that manufactures and commerce, are neither so permanent a source of national prosperity, as the proper cultivation of the soil; nor do they furnish occupation to a description of persons, so remarkable for the integrity of their private conduct, so little inclined to disturb the peace and good order of society, or so able to defend their country, by their personal vigour and strength, as the farmer and the husbandman.

It may be said, that public attention and encouragement can be of no service to agriculture. But in the first place it is to be hoped, that any idea of that kind will not be given way to, until the experiment is fairly tried: in the second place, no ground should be given to the farmer, to imagine, that his interests are neglected, or his profession despised: and in the third place, there is every reason to believe, that public countenance at least, instead of being useless, cannot fail to be attended with the happiest consequences in promoting Agricultural Improvement.

There are three points on which the prosperity of Agriculture must depend. 1. Upon giving the farmer an opportunity of acquiring, with as little trouble and expence as possible, full information respecting the best and most advantageous methods of managing his farm. 2. Upon exciting a spirit of industry and experiment among that description of men. 3. Upon the farmer having a sufficient capital or credit to carry on his operations. With the last it is impossible that the public can have any connexion:* but in regard to the two first points, it is evident that Government may, at a small expence, give the farmer all the information that is necessary; and, either by honorary rewards, or even by giving every active and intelligent cultivator an opportunity of corresponding with a respectable public board, on subjects connected with his pursuits, may make Agriculture so much a topic of conversation among that

* By the farmer, in the above paragraph, is meant *the mere husbandman*, who has only occasion for small sums, and whose security cannot always be depended on. In regard to lending money to the landed interest, in large sums, for which their property might be made responsible, the case is different. In the history of the public revenue, part II. p. 126. originally printed in 1785, I have hinted at the wonderful advantages which might be derived, by expending the surplus of the public revenue, in promoting agricultural improvement. Probably a better use for a sinking fund than any other mode of application. By lending the produce of the sinking fund, on landed security, for the improvement of the country, the public would not only accumulate as great an additional annual income, as by purchasing 3 per cent. stock, but would also acquire a great revenue, from the rapid increase of national prosperity, by which the produce of the taxes, on consumption at least, would be greatly augmented.

class of men, may turn their attention so much to the improvement of the soil, and may excite such an ardour for that purpose, that the happiest consequences may be expected, both to the individuals engaged in that particular profession, and to the kingdom at large.

It is on these principles, that Sir John Sinclair takes the liberty of suggesting, the following plan of a Board of Agriculture. His original idea was, to restrict it to the melioration of British wool alone; but he is now satisfied, that with much the same trouble, and at nearly the same expence, the same Board may successfully direct its attention, to every point connected with the internal improvement of the country.

PLAN OF THE BOARD.

It is proposed that the Board shall consist of twenty-four members, in the same manner as the present Board of Trade,* but not to be restricted to members of his Majesty's Privy Council, as the President of the Royal Society, and other persons, who are not in either House of Parliament, may be useful members. The advantages of a great number of members are, first, that it totally precludes every possible idea of giving salaries to the Board, which would not answer any real purpose of utility, and would at the same time make the institution expensive. Secondly, it would give occupation of a public nature to many respectable individuals, both in and out of Parliament, who are anxious to be employed in public business, but who at present have no particular object, to which they can direct their attention.

The expence of such a Board may be estimated at about £3,000 per annum, to be laid out in the following manner.

	per annum. £.	s.	d.
1. Expence of the house, a secretary and two clerks (for the correspondence will be very extensive), may be stated at -	500	0	0
2. Stationary may amount to - - -	200	0	0
3. Foreign correspondence respecting the Agriculture of other countries, procuring foreign books on Agriculture, seeds, animals, and implements of husbandry - - - -	300	0	0
4. The expence of sending persons to make regular annual surveys of the state of agriculture and sheep-farming, all over the kingdom, for the purpose of establishing correspondence, of ascertaining what improvements have been made, in different parts of the country, the principal defects of each district in the management of their farms, &c.	500	0	0
4. The expence of printing and circulating those surveys, and other works that may be published under the sanction of the Board, together with honorary rewards to corresponding members, who try, in different parts of the country, such experiments, for the improvement of wool, &c. as may be recommended by the Board -	500	0	0
Carry over	£2000	0	0

* With, however, an unlimited number of *corresponding members.*

	per annum.
Brought over -	£2000 0 0
6. The expence of collecting the materials of a Statistical Survey of England, to be carried on under the sanction of the Board of Agriculture. - - -	500 0 0
7. Incidental expences - - -	500 0 0
	£3000 0 0

The above sum, it is believed, will be found adequate to the purposes in view; and in order to obviate every possible objection on the score of expence, it is proposed to establish such a Board for five years only, merely by way of experiment; to be afterwards continued, in the event alone of its answering the important objects for which it was constituted. It was at first intended to propose some additional expence to be laid out in premiums; but upon farther consideration, it was judged more advisable, to leave the giving of *money* in premiums to private societies, and to restrict the donations of a public board, to honorary rewards.

That the public ought not to grudge such a sum for so necessary a purpose, need hardly be long dwelt upon. For objects of general utility, Parliament has often, and ought always to exert itself. The Board of Trade is necessarily attended with some expence. The Royal Society had, from its commencement, a grant of land from the crown. The Board of Longitude has had various considerable sums laid out as premiums, under its authority, for rewarding such as have made any important discovery in the point to which its attention is directed. The culture of flax has been encouraged by public bounties. And where is the object so well entitled to national countenance and support, as that of promoting the general interests of Agriculture, and of ascertaining the best means of bringing it to perfection?

The advantages of such a Board are obvious.

I. It is well known that there are many societies for the improvement of agriculture, in all its various branches, already scattered over the kingdom: and many more would probably be established, were Parliament to sanction the objects of such societies by its approbation. The establishment of such a board, there is reason to believe, would be of incredible service in keeping up the spirit of such institutions, in giving them a proper direction, and in procuring for them more weight and consequence in those parts of the country where they exist. Besides, at present, any improvements made by such societies, are only known within their own narrow sphere: whereas they might be rapidly spread over the whole kingdom, through the medium of a Board of Agriculture, with whom every one of them would be desirous of corresponding.

II. In regard to the idea, that the whole had better be carried on by a private society, it is to be observed that *no private society* can ever have the same weight, either with the farmer at home, or with foreign countries (from which undoubtedly much information may be obtained), as *a public institution*. In the second place, no private society, could be intrusted, like a public board, with a power of receiving and transmitting letters, and even pacquets, duty free, without which, at the same time, it could not be of general benefit; for it is only by frequently dis-

persing small tracts, and not voluminous publications, that the farmer can best be instructed, and roused to activity and exertion. In the third place, a public board may easily collect into one focus, all the knowledge and information that may be acquired by a great number of small societies scattered over the kingdom; may make them useful to each other, and mutually co-operate for the general benefit of the country; but that is a degree of authority, which no private society, however constituted, could possibly acquire.

III. It is now found that an union of husbandry and sheep-farming is the best means of bringing agriculture to perfection; whilst at the same time it furnishes the raw material for our most valuable manufacture. By carrying the improvement of our wool, both in regard to quantity and quality, as far as the soil and climate of Great Britain will admit of (which, if such a Board were established, might be done in the space of a few years), there is every reason to believe, that three millions per annum, in manufactured articles, will be added to the national wealth, in addition to the benefit which the soil will receive from an improved system of husbandry.*

IV. But the part of the plan from which the greatest and most important benefits are to be expected, is that of carrying on a Statistical Survey of England, for the purpose of ascertaining, the real political situation of that part of the kingdom, in every point of view, respecting which a statesman would wish to have information. In the short period of about three years, such a survey of Scotland will be completed, by the voluntary exertions of the Clergy of North Britain; and in the space of five years, a similar survey of England, may be brought to a conclusion. The object of such a survey would be, to ascertain the general state of the Agriculture, the Manufactures, and the Commerce of the country—the means of improvement of which they are respectively capable; the amount of the population of the state, and the causes of its increase or decrease: the manner in which the territory of the country is possessed and cultivated; the nature and amount of the various productions of the soil; the value of the personal wealth or stock of the inhabitants, and how it can be augmented; the diseases to which the people are subject, their causes, and their cure; the occupations of the people—where they are intitled to encouragement, and where they ought to be suppressed; the condition of the poor—the best mode of maintaining them, and of giving them employment; the state of schools, and other institutions formed for purposes of public utility; the state of the villages, and of the towns in the kingdom, and the regulations best calculated for their police and good government; and lastly, the state of the manners, and morals, and the general character of the people, and the articles in regard to which, their situation is most capable of melioration and improvement.

To conclude, it is only by means of such inquiries, that any society can possibly expect to

* There are, at the smallest computation, twenty millions of sheep in Great Britain, whose fleeces may be increased in value to the amount of a shilling each, either by augmenting the quantity or improving the quality of their wool. The increased value of the wool, therefore, would amount to one million, which would be trebled by the art of the manufacturer, and consequently would produce three millions. To this there is to be added, the benefits that would result from the introduction of sheep-farming into different parts of the country, which are better calculated for sheep than for cattle; the superior advantages of which, would soon decisively appear, from the inquiries carried on by the Board now proposed to be established.

enjoy all that political happiness to which it must naturally aspire. By ascertaining facts with minuteness and accuracy, the real state of the country must be made known, and the means of its future improvement will be pointed out. Every field, it may be expected, will then be cultivated to the best advantage, and every measure will be taken, that can best tend to promote the general interests of the community.

APPENDIX. C.

Substance of Sir John Sinclair's *Speech in Parliament, on the 15th of May, 1793, when he proposed the Establishment of a Board of Agriculture.*

Sir John Sinclair began with stating, that having been much occupied of late, in the duties of a new and laborious employment, connected with the preservation of the commercial credit of the country (*that of commissioner for the issue of certain exchequer bills*), he had unfortunately been induced to delay, from time to time, arranging his thoughts, and the information he had collected, on a subject of so very different a nature, as that of husbandry; and consequently was not prepared, to state his sentiments upon the question, to which he now begged to call the attention of the House, so fully as he could have wished: such a circumstance, however, was of less importance, as it was surely unnecessary in that House to descant upon the various public advantages to be derived from agricultural industry, or to attempt to prove, that it was the surest and best basis of national prosperity. These were principles which few thinking and intelligent men were disposed to resist. But an opinion had very much prevailed, that the interference of government, in matters of that nature, had an injurious tendency; that it was the wisest plan to leave them entirely to themselves; and that any public aid or countenance was totally unnecessary.

No position, however, could be more erroneous. If the public were to *dictate* to the farmer how he was to cultivate his grounds, or how he was to improve his stock, the enforcing of such directions, might be the source of infinite mischief; but to collect information on the subject of agriculture; to print and circulate that information, when collected; to encourage a spirit of experiment; and to favour with public countenance, and perhaps with public aid, such as shewed a good example of rural industry to their neighbours, instead of being mischievous, must be attended with the happiest consequences; and though, in some parts of the kingdom, the principles of agriculture unquestionably were well understood, and the ground was kept in a very high state of cultivation, yet when it was considered—that immense districts, situated in the richest parts of England, and naturally fertile, still continued waste and useless—that a very small proportion of the cultivated part of the kingdom had as yet been brought under a proper system of husbandry—that any degree of perfection in the implements of husbandry had been rarely attained—and that the stock of the farmer, had been still more rarely brought to that height of improvement, of which it was capable, it was surely a matter of surprise, whence it

arose, that a measure of so important a nature as the present, embracing such a variety of interesting objects, had not been sooner brought under the consideration of parliament. "We had heard much, he observed, of other sources of national prosperity, but we seem to forget that no nation could be permanently happy and powerful, that did not unite a judicious system of agriculture, to the advantages of domestic manufacturing industry, and to the benefits of foreign commerce."

The great advantages to be derived from agricultural improvements, might, he said, be stated in various points of view.

It is supposed that there are sixty-seven millions of acres in Great Britain, of which seven millions are occupied with houses, roads, rivers, lakes, &c. or by nature are totally incapable of cultivation; there remained therefore sixty millions; five millions of which only were employed in raising grain, twenty-five millions were appropriated to pasturage, and might be considered as sufficiently productive, and there remained thirty millions, either completely waste, or under a very defective system of husbandry. That was an object, in every point of view, of astonishing value and importance. Disgraceful indeed it was, that nearly one half of the kingdom, which, by fair calculation, might furnish subsistence to above ten millions of people, should remain in such a state.

The stock of the farmer, he observed, might be rendered infinitely more valuable than at present, without requiring a greater quantity of food, or any additional care or expence.

Of black cattle it is supposed that there are five millions in the island. As the breed of cattle has not been brought to any great perfection, except in particular districts, an addition of a pound sterling to the value of each, would not probably be found too high an estimate, though this would add five millions per annum to the national wealth.

There are at least twenty millions of sheep in these kingdoms, which might be greatly improved in regard both to fleece and carcass. On the supposition, however (in some cases, by increasing the quantity; in others, by improving the quality of the fleece, leaving the carcass, for the present, out of the question), that one shilling was added to the value of the wool of each sheep, the result would be one million sterling. The manufacturer of wool, it is well-known, can treble the value of the raw material, and consequently there would thence arise an addition of three millions per annum to the wealth of the nation. The profit that would arise by improving the carcass, in the opinion of the ablest breeders, would be still more considerable.

Great improvements might also be made in other kinds of stock. Great savings would arise by the use of improved implements of husbandry, whilst by following judicious systems, adapted to the different soils in the kingdom, ground would be cultivated at much less expence, and with a greater prospect of advantage. In addition to all which, it is to be considered, that these improvements would furnish the means of useful and healthful occupations to many thousands, almost millions of people, who, from the integrity of their private conduct, and the strength and vigour of their constitutions, are undoubtedly that description of persons, whom it is natural to wish should, as much possible, be multiplied in these kingdoms.

For the purpose of securing all these advantages, and in order to direct the attention of the people of this country to improvements of a nature so beneficial and so permanent, he was perperfectly satisfied, that the establishment of a national Board of Agriculture, was absolutely necessary.

The advantages of such a Board were obvious.

In the first place, it might be considered as a general magazine for agricultural knowledge, and a board of reference, to which any question might be sent, connected with the improvement of the country. At present, government had no channel for obtaining information, respecting many points, in which the general interests of the country were deeply involved. Questions respecting commerce were referred to a Board of Trade, constituted for that express purpose; but no channel as yet existed for obtaining authentic information respecting the agriculture of the country, though undoubtedly of more general importance.

In the second place, by agricultural surveys, carried on under the auspices of such a Board, every fact or observation known in this country, connected with the improvement of the soil, or the stock it maintained, would soon be collected. The circulating of that information could not fail to be attended with the happiest consequences. The discoveries of one district, would be immediately communicated to another; a spirit of experiment would be excited; and every farmer in the kingdom would contribute his mite to the general benefit of his profession.

In the third place, by establishing an extensive foreign correspondence, no improvement or discovery could be made in husbandry, in any quarter of the globe, that would not be immediately made known, and communicated to the people of this country, with much greater speed, and to greater advantage, than if private exertion and correspondence were alone to be depended on.

In the fourth place, a public board might be entrusted with the privilege of franking, a point of very great importance, for without that privilege, it is well known that no information, however useful, except at an enormous expence, could be rapidly spread over the country. That was a privilege with which no private society could be invested, but to which a public body had the justest pretensions.

In the fifth place, it was only through the medium of such a Board, that any general improvement of stock could be looked for. Such improvement, however desirable, could not always be effected without concentrating the knowledge of a great number of individuals of different professions. In regard to sheep, for instance, the breeder, the grazier, the manufacturer of wool, the butcher, the currier, and the consumer, must all be satisfied, that a change in the breed of any particular district is calculated for their respective interests. So great an alteration in the opinions and the prejudices of great numbers of individuals, could only be effected by the authority and influence of a public board, and far surpassed the exertions of any body of private men, however active or respectable.

In the last place, such a Board might be the means of obtaining a Statistical Account of England; and consequently of explaining the real situation of the country, in every point of view, that could possibly be wished for by a patriot or a statesman. Such an account of Scotland was already nearly completed, and specimens of it having been circulated abroad, it had received the most flattering marks of approbation. If in England, therefore, the same plan were executed, it would hardly be doubted that it would soon be universally adopted in every other country; and thus the principles of political society, and the sources of national improvement, would be more completely ascertained, than in any former period of history.

That such was the natural tendency in the mind of man, to startle at any new proposal, that he certainly would not have ventured to have made such a motion in Parliament, had he not every reason to believe, *from much experience in undertakings of a similar nature*, that it could not fail to be successful; and, in order to satisfy the most timid and scrupulous, he intended to propose, that the expence should not exceed £3000. per annum, and that the experiment should only be tried for the short period of five years; at the conclusion of which, however, he trusted, that the advantages of the institution would be so clear and manifest, that he would be a bold and hardy man indeed who would oppose its being continued. It was also intended, that the members of the Board should act without any emolument whatever. He added, "that such as had witnessed the laborious exertions of those gentlemen, who were nominated to the important trust of preserving the commercial credit of the country, would not hesitate to declare, that the business of a board, who have no salaries annexed to their situations, may be ably and faithfully administered."

That the mention of the Board above alluded to, would justify the observation, that if at any time attention to agriculture was necessary, the present undoubtedly was the moment; when the hazardous state of commercial enterprizes, was so clearly demonstrated, and when it has become necessary to think how to furnish the means of subsistence to a multitude of individuals, who, in consequence of the late failures of a mercantile and manufacturing nature, have been driven from their usual sources of employment.

That when persons talked with raptures of the great wealth brought into this country by commerce, they did not consider, that the nation, in many cases, lost as much by neglecting agriculture as they gained by commerce; of which a stronger instance could not be given than this—that in the northern parts of England, in the course of last harvest (1792) grain to a very considerable amount, actually perished, for the want of labourers to gather in the crop, all the hands in the neighbourhood being employed in carrying on manufactures. It was evidently of little consequence, gaining in one respect, if in another, a loss was sustained, of equal, or perhaps of superior importance.

That an ancient author (Pliny) had happily described the natural sources of the wealth of this country, and his sentiments on that subject, in the nervous translation of that great political writer, Harrington, in his *Oceana*, could not be too frequently recalled to the attention of the people of Great Britain. "O! most blessed and fortunate of all countries, Britannia! How "deservedly has nature, with the blessings of heaven and earth, endued thee! Thy ever fruitful "womb, is not closed with ice, nor dissolved by the raging star. Thy woods are not the harbour "of devouring beasts, nor thy continual verdure the ambush of serpents, but the food of innume-"rable herds and flocks, presenting thee, their shepherdess, with distended dugs or golden "fleeces." Such was the opinion of an intelligent author, who wrote so many centuries ago. "Let me ask," he said, "whether the distended dugs, and golden fleeces of the country, are "not still among the principal characteristics of British wealth?"

That the objections to such a proposal (if any could be seriously urged) it was unnecessary to anticipate. It was one of those measures, it might be said, which, if it produced no good, could not possibly do any harm, but which he viewed in so different a light, that he had no hesitation in pledging any little credit he might have in the House, that it would be the source

of as much real benefit to the country, as any proposition that ever was brought under the consideration of Parliament.

On these grounds he took the liberty of moving, " that an humble Address be presented to his Majesty, intreating that his Majesty would be graciously pleased, to take into his Royal consideration the advantages which might be derived, by the public, from the establishment of a Board of Agriculture and Internal Improvement, &c. &c."

APPENDIX. D.

The Charter of the Board of Agriculture.

GEORGE THE THIRD by the grace of God, King of Great Britain, France, and Ireland, Defender of the faith, and so forth, to all to whom these presents shall come greeting. Whereas it appears to us, that great advantages may be derived from the establishment of a Board, Society, or body corporate, for the Encouragement of Agriculture and Internal Improvement, know ye, therefore, that we, of our especial grace, certain knowledge, and mere motion, have ordained, given, and granted, and by these presents, for us, our heirs, and successors, do ordain, give, and grant, that there shall be, for ever hereafter, a Board or Society, which shall be called by the name of the BOARD or SOCIETY FOR THE ENCOURAGEMENT OF AGRICULTURE AND INTERNAL IMPROVEMENT; of which Board or Society we do hereby declare ourselves to be the Founder and Patron. And that the said Board or Society shall consist of a President, and of a certain number of Members, to be hereinafter mentioned; who, by the name of the Board or Society for the Encouragement of Agriculture and Internal Improvement, shall for ever hereafter be a body politic and corporate, in deed and in law; and shall by the said name and style have perpetual succession; and that they and their successors, by that name, shall and may, for ever hereafter, be enabled and rendered capable, and have power, notwithstanding the statutes of mortmain, to have, purchase, take, acquire, receive, possess, enjoy, and hold to them and their successors, manors, messuages, lands, rents, tenements, annuities, hereditaments, liberties, franchises, jurisdictions, goods, and chattels, of whatsoever nature or kind, in fee, and perpetuity, or for terms of life, or years, or otherwise; and all manner of goods, chattels, and things whatsoever, of what nature soever. And we do for us, our heirs, and successors, hereby give and grant unto the said Board or Society, and their successors, by the name aforesaid, our especial licence, full power, and lawful and absolute authority, to hold and enjoy manors, messuages, lands, tenements, and hereditaments, whatsoever, which may be hereafter devised, granted, or sold to the said Society; and also to purchase, hold, receive, and possess, in mortmain, in perpetuity, or otherwise, to, or to the use of, or in trust for them, or their successors, for the use and benefit of the said corporation, from any person or persons, bodies politic or corporate, their heirs and successors, respectively, such manors, lands, tenements, rents, or hereditaments, as they shall think fit to purchase, or shall be given, granted, devised, or con-

veyed to them, by deed or otherwise, not exceeding the yearly value of ten thousand pounds, over and above all charges and reprizes, so far as they are not restrained by law. And also to sell, grant, demise, exchange, and dispose of any of the same manors, messuages, lands, tenements, and hereditaments, whereof or wherein they shall have any estate of inheritance, or for life or lives, or years, as aforesaid. And that it shall and may be lawful for any person or persons, bodies politic or corporate, their heirs and successors respectively, to give, grant, sell, alien, assign, devise, bequeath, or dispose of, in mortmain, in perpetuity, or otherwise, to, or to the use and benefit of, or in trust for, the said Board or Society, any manors, messuages, lands, rents, tenements, annuities, and hereditaments whatsoever, not exceeding the yearly value of ten thousand pounds in the whole, above all charges and reprizes, in any manner not repugnant to, or made void by, the statute, passed in the ninth year of the reign of our late royal grandfather, King George the Second, intitled, " An Act to restrain the Disposition of lands, whereby the same become unalienable." And also any sum or sums of money, goods, and chattels, whatsoever, of what nature or value soever, in any manner not repugnant or made void as aforesaid. And we do further, for us, our heirs and successors, grant, that the said Board or Society, and their successors, by the name aforesaid, shall and may be capable to sue and be sued, plead and be impleaded, answer and be answered unto, defend and be defended, in all courts and places whatsoever, of us, our heirs and successors, before any of our judges and justices, and other officers of us, our heirs and successors, in all and singular actions, suits, plaints, causes, matters, demands, and things whatsoever; and to act and do in all matters and things relating to the said Board or Society, in as ample manner and form as any other our liege subjects, being persons able and capable in the law, or any other body politic or corporate, in this part of our kingdom of Great Britain called England, lawfully may or can act, or do, sue or be sued, plead or be impleaded, answer or be answered unto, defend or be defended. And that the said Board or Society, for ever hereafter, shall and may have and use a common seal, for the causes and businesses of them and their successors; and that it shall and may be lawful for them and their successors, to change, break, alter, and make new, the said seal, from time to time, as they shall think fit. And that our royal intention may take the better effect, we do hereby, further, for us, our heirs and successors, grant and declare, that the said Board or Society, in all times hereafter, shall consist of a President, of such several Members by virtue of their several offices, as hereinafter mentioned, and of thirty ordinary Members: and that the said Board or Society shall have full power and authority to nominate and appoint such, and so many, honorary Members as to them shall seem meet: which said honorary Members shall have a right to be present at all deliberations of the said Board or Society; but shall not have the power of voting in any question to be agitated thereat: and further, that the said Board, or Society, shall and may have full power and authority, to nominate and appoint such a number of corresponding members, whether natives or foreigners, as may seem best adapted for carrying the objects of the said institution into full effect; but which corresponding members shall have no right of voting in any question to be agitated before the said Board or Society; nor any right of being present at the deliberations thereof. And for the better execution of this our royal grant, we have nominated, constituted, and appointed, and by these presents do nominate, constitute, and appoint, our trusty and well beloved Sir John Sinclair, Baronet, to be an

ordinary member of the said Board or Society, and to be the first and modern President thereof; to continue in the said office from the date of these our letters patent, to the twenty-fifth day of March, one thousand seven hundred and ninety-four, and until another person, of the said Board or Society, shall be duly chosen and admitted into the said office in his room, in manner hereinafter mentioned. And we do hereby further nominate, constitute, and appoint the most Reverend Father in God, our right trusty and right entirely beloved councillor, John, Lord Arch Bishop of Canterbury, and the Arch Bishop of Canterbury for the time being; our right trusty and well beloved councillor, Alexander, Lord Loughborough, our Lord High Chancellor of Great Britain, and our Lord High Chancellor of Great Britain, or the Lord Keeper of the Great Seal for the time being; the most Reverend Father in God, our right trusty and right entirely beloved councillor, William, Lord Arch Bishop of York, and the Arch Bishop of York for the time being; our right trusty and right well beloved cousin and councillor, Charles, Earl Camden, Lord President of our Council, and the Lord President of our Council for the time being; our right trusty and entirely beloved cousin and councillor, Granville Levison, Marquis of Stafford, Knight of the most noble order of the Garter, Lord Keeper of our Privy Seal, and the Lord Keeper of our Privy Seal for the time being; our right trusty and well beloved councillor, William Pitt, Esquire, First Commissioner of our Treasury, and the First Commissioner of our Treasury for the time being, in the vacancy of the office of the Lord High Treasurer, and the Lord High Treasurer for the time being; our right trusty and right well beloved cousin and councillor, John, Earl of Chatham, First Lord Commissioner of the Admiralty, and the First Lord Commissioner of the Admiralty for the time being, in the vacancy of the office of Lord High Admiral, and the Lord High Admiral for the time being; the Right Reverend Father in God, our right trusty and well beloved councillor, Beilby, Bishop of London, and the Bishop of London for the time being; the Right Reverend Father in God, our right trusty and well beloved Shute, Bishop of Durham, and the Bishop of Durham for the time being; our right trusty and well beloved councillors, William Wyndham, Baron Grenville, and Henry Dundas, Esquire, our two principal Secretaries of State, and the two principal Secretaries of State for the time being; our right trusty and right entirely beloved cousin and councillor, Charles, Duke of Richmond, Knight of the most noble order of the Garter, Master General of our Ordnance, and the Master General of our Ordnance for the time being; our right trusty and well beloved councillor, Henry Addington, Esquire, Speaker of the House of Commons, and the Speaker of the House of Commons for the time being; our trusty and well beloved Sir Joseph Banks, Baronet, President of the Royal Society, and the President of the Royal Society for the time being; our trusty and well beloved John Robinson, Esquire, surveyor general of our woods and forests, and the surveyor general of our woods and forests for the time being; and John Fordyce, Esquire, surveyor of the crown lands, and the surveyor of the crown lands for the time being; to be now, and in all times coming, by virtue of their several offices, and so long as they shall hold the same respectively, members of the said Board or Society. And we do hereby further nominate, constitute, and appoint, our right trusty and right entirely beloved cousin and councillor, Augustus Henry, Duke of Grafton; our right trusty and right entirely beloved cousins, Francis, Duke of Bedford; and Henry, Duke of Buccleugh, Knight of the most ancient order of the Thistle; our right trusty and entirely beloved cousin and councillor, Thomas, Marquis of Bath, Knight of the most noble

order of the Garter; our right trusty and right well beloved cousin, George, Earl of Winchelsea; and James, Earl of Hopetoun; William, Earl Fitzwilliam; George Wyndham, Earl of Egremont; James, Earl of Lonsdale; Francis, Earl of Moira, in our kingdom of Ireland; and John Joshua, Earl of Carysfort, of our said kingdom, Knight of the illustrious order of Saint Patrick; the Right Reverend Father in God, our right trusty and well beloved Richard, Bishop of Landaff; our right trusty and well beloved Martin Bladen, Lord Hawke; Edward, Lord Clive, of our kingdom of Ireland; and John Baker, Lord Sheffield, of our said kingdom; our right trusty and well beloved councillor, William Wyndham, Esquire; our trusty and well beloved Charles Marsham, Esquire; Sir Charles Morgan, Baronet; William Pulteney, Thomas William Coke, Thomas Powys, Henry Duncombe, Edward Loveden Loveden, John Southey Somerville, Robert Barclay, Robert Smith, George Sumner, John Conyers, Christopher Willoughby, and William Geary, Esquires, to be the first and modern ordinary members of the said Board or Society; to be continued ordinary members of the said Board or Society, from the date of these our letters patent, to the twenty-fifth day of March next following; and from thence, until other fit persons shall be chosen to be members in their stead, respectively, in the manner and at the periods hereinafter mentioned, if they shall so long respectively live, and shall not be removed for some just and reasonable cause, in manner hereinafter mentioned. And the said members and their successors shall, at all times, be aiding, advising, and assisting in all affairs, businesses, and things, concerning the better regulation, government, and direction of the said Board or Society. And we will and ordain, and for us, our heirs and successors, do hereby further grant to the said Board or Society, and their successors, that they, or any seven or more of them, who shall assemble for that purpose, of which the President or his deputy shall always be one, may, on the said twenty-fifth day of March next, and so yearly and every year, on the said day, or as near to the same as may conveniently be, nominate and choose one of the ordinary members of the said Board or Society for the time being, to be President thereof, until the twenty-fifth day of March next ensuing; and from thence until another be chosen and admitted into the said office in his room. And in case the President of the said Board or Society shall, during the continuance of his said office, happen to die or be removed (which President, for misdemeanors, or other reasonable cause, is hereby declared to be amoveable by the rest of the said members, or the major part of them) that then and so often, it shall and may be lawful for the members of the said Board or Society, or any seven or more of them, to meet within fifteen days after such death or removal, and to choose one of the said ordinary members to be President of the said Board or Society; and that the person so chosen by the majority of the said seven, or more, of the members of the said Board or Society, shall be President of the said Board or Society, and continue in that office until the twenty-fifth day of March, then next following, and until another shall be duly elected and admitted into the said office in his room. And that in case any one or more of the ordinary members of the said Board or Society shall happen to die or be removed, which ordinary members, or any of them, for misdemeanors or other reasonable cause, are hereby declared to be amoveable by the President and rest of the said members, or the major part of them, that then, and so often, it shall be lawful for the President and members aforesaid, or any seven or more of them, (of which the President or his deputy always to be one) to choose one or more of the honorary members of the said Board or

Society, in the room of him or them so deceasing or removed, to complete the number of the said ordinary members; and that the person or persons so chosen and admitted, shall continue to be an ordinary member, or ordinary members, of the said Board or Society, until the twenty-fifth day of March then next ensuing, and until other person or persons shall be duly chosen and admitted in his or their room respectively. And we do hereby further for us, our heirs and successors, give and grant unto the said Board or Society, that they and their successors, for ever, or any five or more of them, (whereof the President for the time being, or his deputy, shall always be one) shall and may, yearly, upon the said twenty-fifth day of March, or as near the same as conveniently may be, choose and nominate five of the honorary members of the said Board or Society, to supply the places of five of the aforesaid ordinary members of the said Board or Society, it being our Royal will and pleasure, that five, and no more, of the ordinary members aforesaid, should yearly be changed, at every such annual election. And we do hereby for us, our heirs and successors, further grant to the said Board or Society, and to their successors, that whereas the President of the same for the time being, may happen to be sick, indisposed, or be otherwise employed, so that he cannot attend the business of the said Board or Society, it shall be lawful for the said President, at his pleasure, to nominate, at the same time, or at different times, four persons of the ordinary members of the said Board or Society, for the time being, to be his deputy or deputies; one of which, the senior in nomination, who shall be present, or in readiness, shall, in the absence of the President, be empowered, and is hereby empowered, to supply the place of the President, and to do all acts concerning the Board or Society, and the business of the same, which the President, by virtue of his said office, might do, if he were himself actually present; and that every person, so nominated by the President for one of his deputies, shall continue in the said office, all the time that the said President shall himself continue in his office of President, unless such person shall be removed by the President from the said office, or be rendered incapable of holding the same, by ceasing to be a member of the said Board or Society. And further, we do hereby for us, our heirs and successors, give and grant to the said Board or Society, and their successors, that they shall and may have one Treasurer, one Secretary, two or more Surveyors for examining into the state of the Husbandry in these our kingdoms, and one Under-secretary, and one or more Clerk or Clerks, together with such agents and other officers as may be necessary and useful to the said Board or Society. And we do hereby nominate and appoint or trusty and well beloved Sir John Call, Baronet, to be the first and modern Treasurer; and our trusty and well beloved Arthur Young, Esquire, to be the first and modern Secretary of the said Board or Society, each of them respectively to be continued in their respective offices to the twenty-fifth day of March next following the day of the date of these presents. And we do hereby for us, our heirs and successors, authorise and empower the said Board or Society, and their successors, from time to time, for ever hereafter, yearly and every year, on the said twenty-fifth day of March, or as near the same as conveniently may be, to nominate and choose honest and discreet men for treasurer and secretary; and in case any of them, the aforesaid officers of the said Board or Society, shall happen to die, or be removed from their respective offices, then and so often, it shall and may be lawful to and for the said Board or Society, and their successors, to elect and choose one or more into the office or offices which shall so become vacant, to continue therein during the residue of that year, and until others shall be duly chosen in their respective place or places. And we do further, for us, our heirs and suc-

cessors, hereby give and grant to the said Board or Society, full power and authority to erect and build any house, college, or hall, within the city of London, or within ten miles thereof; and in the same, or in any other house, college, hall, or other convenient place, in London, or within ten miles thereof, to assemble and meet together, as the said President shall appoint, by summons or other notice, which he is, by these presents, empowered and required timely to issue for that purpose, to all the said members; and that they, being so met together, shall have full power and authority, from time to time, to make, constitute, and establish such and so many statutes, rules, orders, bye-laws, and ordinances, as shall appear to them to be good, useful, honest, and necessary, for the government, order, and regulation of the said Board or Society, and every member thereof; and to do all things else concerning the government, estate, goods, lands, revenues, and other businesses and affairs of the said Board or Society: All which laws, statutes, and ordinances so made, we do hereby will and command, shall and may be, from time to time, inviolably observed and kept, according to the tenour and effect thereof, so as the same be just, honest, and reasonable, and no ways repugnant or contrary to the laws of this our realm. And we do hereby, for us, our heirs and successors, further give and grant unto the said Board or Society, and their successors, full power and authority, from time to time, to elect and choose one or more printers and gravers, and by writings sealed with the common seal of the said Board or Society, and signed by the President for the time being, to grant unto them power to print such things, matters, and businesses, concerning the said Board or Society, as shall from time to time be committed to them, and for promoting such experiments and inquiries as the said Board or Society may be employed in. We do further for us, our heirs, and successors, give and grant unto the said Board or Society, and their successors, from time to time, by letters under the hand of the President of the said Board or Society, or his deputy, to hold correspondence and intelligence with any strangers, whether private persons or collegiate societies, or corporations, without any interruption or molestation whatsoever: Provided always, that this our indulgence or grant be extended to no further use, than the particular benefit and interest of the said Board or Society, in matters connected with the objects of this institution, and be not contrary to law. And we do hereby strictly charge and command all justices, mayors, aldermen, sheriffs, bailiffs, constables, and all other officers, ministers, and subjects whatsoever, of us, our heirs, and successors, to be, from time to time, aiding and assisting unto the said Board or Society, in and about all things, according to the true intent and meaning of these our letters patent. And lastly, we will, and by these presents, for us, our heirs, and successors, do grant to the said Board or Society, and their successors, that these our letters patent, or the inrolment or exemplification thereof, and all and singular matters and things, in the same contained, shall and may be good, firm, valid, sufficient, and effectual in the law, according to the true intent and meaning of the same: and shall be taken, construed, and adjudged, in the most favourable and beneficial sense, for the best advantage of the said Board or Society, and their successors, as well in all our courts of record, as elsewhere; by all and singular judges, justices, officers, ministers, and other subjects whatsoever, of us, our heirs and successors; any omission, imperfection, defect, matter, cause, or thing whatsoever to the contrary thereof, in anyways notwithstanding, without fine in our hanaper, &c. In witness whereof, we have caused these our letters to be made patent. Witness Ourselves at Westminster, this twenty-third day of August, in the thirty-third year of our reign. BY THE KING, (SIGNED) WILMOT.

APPENDIX. E.

Substance of Sir John Sinclair's *Address to the Board of Agriculture, on the first Day of its being assembled.*

THAT he could not forbear troubling the Board with a few words, congratulating the Members present, on the complete establishment of so invaluable an institution as that of *a Board of Agriculture.* That in other countries attempts of a similar nature, on a humbler scale, had been made; but that the present, he believed, was the first instance, of such an institution having been snatched from the feeble hands of individuals, and invested with all the strength and vigour of public establishment.

That from the circumstance of his having moved in Parliament for the establishment of that Board, HIS MAJESTY had been graciously pleased to nominate him as President, a situation, to which he could not otherwise have aspired, among so many Members, distinguished by superior talents, and possessed of greater experience and skill in husbandry; but that he would endeavour to make up for any personal deficiency, by the most unwearied zeal and attention, to promote the objects for which the Board was constituted.

That no man would have ventured to have made such a motion in Parliament, without having previously sketched out, in his own mind, some general ideas, respecting the system that might be pursued, in case the proposed institution should take place, and that he would shortly state to the Board, what had occurred to him upon the subject.

That having carried on, for some years past, a correspondence with above 1500 individuals, on matters of a public nature (for promoting the improvement of British wool, and examining, with great minuteness, into the political state of Scotland) he was enabled, by the experience which he had thus acquired, to ascertain, in a great measure, those leading principles, on which so great and extensive a plan might be conducted, and these he would shortly submit to the consideration of the meeting.

That, in the first place, he had much satisfaction, in stating, as the foundation on which the edifice of national improvement might be built, that there existed in these kingdoms, a greater fund of solid ability, and of useful information, and a greater extent of actual and efficient capital, than, so far as he could judge, any other country of the same extent and population in the universe could boast of; and that little more would be necessary, but to call forth that ability, and to collect that information, and to give the capital of the country a direction or tendency to increase internal wealth and cultivation, in preference to more distant objects, in order to make this island, what it ought to be, "*The Garden of Europe.*"

In the second place, he was certain, that there existed a greater mass of public spirit in the nation at large, (more especially among that description of people, with whom the Board of Agriculture was principally connected) than was commonly imagined; and he was satisfied, that the Board would find no difficulty, in prevailing on the active and intelligent husbandmen

of this kingdom, to try any experiment, or follow any system, that could contribute to the public good, and did not materially militate against their own personal interests; and that a wide difference would be found, between a recommendation to improvement, coming from a respectable public body, than if it came from private individuals.

In the third place, this principle ought ever to be kept in view, that in a good cause, nothing can resist industry and perseverance. That at first, some doubts or jealousies might be entertained of a new institution, and some rumours might be circulated respecting the objects of the Board, which time would soon do away. But for his part, he entertained no doubt, that if Parliament would continue its pecuniary assistance for some years, (promoting, at the same time, by wise regulations, a general system of improvement) and if the Board (which he was persuaded would be the case) would steadily persist in its exertions, that in a very short period, the produce of many millions of acres, now cultivated in a very defective manner, would be greatly augmented; that many millions of acres, now lying waste, would be brought under cultivation, and that the stock of the kingdom would be improved, to at least double its present value.

In regard to the plan to be pursued, he submitted to the consideration of the Board, whether the first object ought not to be, *to ascertain facts*, without which no theory or system of reasoning, however plausible, could be depended on. That for that purpose, it would be necessary to examine into the Agricultural State of all the different Counties in the kingdom, and to inquire into the means, which, in the opinion of intelligent men, were the most likely to promote, either a general system of improvement, or the advantage of particular districts. That by employing a number of able men for that purpose, and circulating their Reports previous to their being published, requesting the additional remarks and observations of those to whom such communications were sent, it was probable, that no important fact, or even useful idea, would escape notice.

That the immense mass of information thus accumulated, would answer two purposes: first, it would point out the measures which the Legislature might take, for promoting Agricultural improvements; secondly, individuals would thus be instructed, by the practice and experience of others—the landlord in the proper mode of managing his property, and the farmer in the best plan of cultivating his fields.

That for attaining the first object, that of legislative assistance, it would be proper to digest the substance of the information that was accumulated, into one Report, to be submitted to the consideration of HIS MAJESTY, and of both Houses of Parliament; suggesting, in the Report, what measures had occurred, in the course of their inquiries, that could tend to the improvement of the country. He added, that from the spirit with which these Agricultural Surveys had been gone into, there was some reason to hope, that a Report might be drawn up, on the general state of the Husbandry of the kingdom, in time sufficient to enable Parliament, to take some effectual measures for the benefit of Agriculture, in the course even of the ensuing session.

That Parliament might be of essential service to Husbandry in two respects: first, by removing *all discouragements to rural industry;* and secondly, by granting *encouragements*. That the second was a matter of much delicacy, and which required very mature consideration.

At the same time it was certain, that by granting encouragements to Agriculture, the great Frederick of Prussia was enabled to double the value of his dominions, and to amass a very considerable treasure, amounting, it is well known, to many millions sterling. That such encouragements operated like manure spread upon the ground, which insured a more abundant harvest. That they also had a tendency to impress on the public mind this truth, "that the proper cultivation of the soil, is an object so particularly interesting to the community at large, that those who most assiduously attend to it, are, perhaps, to be accounted the most meritorious citizens of their country." That in one point of view, at least, the husbandman was more intitled to public attention than those who followed other professions, being more fixed to the territory on which he lived, and less apt, from habit, inclination, or ability, to wander from it.

That in regard to instructing individuals, no doubt could be entertained, from the great mass of information which would be accumulated, by the correspondence of the Board, both at home and abroad, that the best mode of managing landed property, or in other words, the most advantageous system of connexion, between the landlord and the tenant, would be ascertained, and that the principles of rational husbandry, for the instruction of the practical farmer, would soon be brought to a very great degree of simplicity and perfection.

That he would not anticipate, with too much confidence, the important consequences, that might result from such an institution. He believed, however, there was none, from which the public at large, had reason to expect so many substantial benefits. That the Board, indeed, was already looked up to, even by foreign nations, as likely to become *the general magazine of knowledge on Agricultural subjects*. That they already considered it as the source from which they were to derive the most important information, and the most solid advantages. That in these respects, at least, Agriculture had an advantage over other arts, that no jealousy subsisted among those who were engaged in it, and that every discovery, which tended to its improvement, more essentially contributed, than any other, to promote the general good of the species.

He should only add, that if the measures he had ventured to hint at, and others connected with the internal improvement of the country, which he would afterwards take an opportunity of suggesting, were approved of by the Board, and carried on with alacrity and zeal, that he was willing to dedicate the whole of his time, and exertions, to assist in the prosecution of them; fully convinced that no pursuits could be more gratifying to the mind for the present, or would be recollected in future, with more heartfelt satisfaction.

APPENDIX. F.

Sir John Sinclair's *Address to the Clergy of the Church of England, on the Nature and Principles of Statistical Philosophy.*

THE object of all political society evidently is this, that every individual connected with it, shall have the means of enjoying, as much real happiness, as the imperfect condition of human nature will admit of.

In order to secure an adequate proportion of happiness to each individual, it is a duty incumbent on every government, whatever its form may be, to make minute and regular inquiries, into the circumstances of the people over whom it is placed, for the purpose of ascertaining, to what extent they already enjoy the advantages of political society, or in what respects their situation can be ameliorated.*

To that science, which points out the proper objects of such inquiries, and the surest means of making them effectual; the science consequently, which tends most to promote, both the good of the individual, and the prosperity of a state; which indeed includes in it every object of real utility, connected with, or arising from, the existence of political society, I have ventured to give the name of STATISTICAL PHILOSOPHY. †

* If all governments were impressed with a proper sense of this important duty, it would be of less consequence what the particular form was; only that form would be the most desirable, where such inquiries were the most likely to take place, namely, in a well regulated monarchy, in which the people had a proper organ by which they could act; for under that form, as soon as the existence of the duty above alluded to was known, and acknowledged, the prince, for the sake of the glory and the satisfaction resulting from statistical investigations; and the people, from feeling the advantages to be derived from them, would take care that any necesssary inquiry into the state of the country should not be neglected. It does not require the spirit of prophecy to foresee, that as soon as the present war is over, such inquiries will become general in Europe. The attention of the people will then be diverted, from delusive phantoms of ideal liberty, to those objects which constitute the real happiness of the individual, and the solid interest of the state.

† It is now about forty years, as we are informed by professor Zimmerman, in his Political Survey of Europe, that a branch of political knowledge, which has for its object the actual and relative power of the several modern states, the power arising from their natural advantages, the industry and civilization of their inhabitants, and the wisdom of their governments, has been formed, chiefly by German writers, into a separate science. It used formerly to be improperly connected with geography; and it was but superficially treated amidst the topographical and descriptive details of the larger geographical works. By the more convenient form it has received, and by its growing importance, this science, distinguished by the new coined name of STATISTICS, is become a favourite study in Germany. The best account of the origin of statistical inquiries is given in Baron Bielfield's Elements of universal Erudition.

It is not proposed, on the present occasion, to enter minutely into the various important topics connected with so extensive a subject. It may be sufficient now to remark, that it is by an anxious attention to facts, to which the great improvements which have been recently made in chemistry, in mechanics, and in other arts and sciences, can alone be attributed.—Since these have rested, not on visionary theory, but on the sure basis of investigation and experiment, they have been carried, in modern times, to a degree of certainty and perfection, of which anciently they were supposed incapable. It is by pursuing the same method, in regard to political disquisitions, by analyzing the real state of mankind, and examining, with anatomical accuracy and minuteness, *the internal structure of society*, that the science of government can alone be brought to the same height of perfection.

Many inquiries, it is certain, have at various periods, been made into the political circumstances of nations: unfortunately, however, they have uniformly been instituted, with a view of ascertaining the state of the country, for the purposes of taxation and of war, and not of national improvement. Their object has been, not to meliorate the condition of the people, but to fill the exchequer, or the armies of the state;* and the utmost that could be expected from them, was to render taxation, and other public burdens, less unequal. But, in modern times, more extensive and more important objects of investigation have been pointed out. Real statesmen, and true patriots, no longer satisfied with partial and defective views of the situation of a

In regard to the words *statistic* or *statistical*, they may either imply inquiries connected with the state of a country, or respecting matters of state; the first is the point of view in which I propose to consider them. The particular term made use of, however, is of little consequence. As to the thing itself, it may be sufficient to remark, that the inquiries instituted in Germany, of a *statistical* nature, were merely for the purpose of ascertaining the political strength of a country, and not the quantum of happiness it enjoys, and far less the means of its future improvement. This is a *new* branch of politics, therefore, the superior utility of which many of the most respectable characters in Germany, and in other parts of Europe, have acknowledged in the most flattering terms, and which a great American warrior and statesman, the President of the American Congress (General Washington) in a letter to the author has thus characterized. "I cannot but express myself highly pleased with the undertaking in which you are engaged (that of drawing up the *Statistical* Account of Scotland) and give my best wishes for its success. I am fully persuaded, that when enlightened men will take the trouble to examine so minutely into the state of society, as your inquiries seem to go, it must result in greatly ameliorating the condition of the people—promoting the interests of civil society—and the happiness of mankind at large.—These are objects truly worthy the attention of a great mind, and every friend to the human race, must readily lend his aid towards their accomplishment."

* Sallust, in his Orat. ad Cæsarem de Republ. ordin. II. i. cap. i. has clearly explained the objects of ancient statesmen. "In republica, cognoscenda, multam, magnamque, curam habui, uti quantum, *armis, viris, opulentia*, ea possit, cognitum haberem." From Townsend's Travels to Spain, vol. 3. p. 348, it appears, that in 1575, Philip II. proposed making similar researches, on a very great and extensive scale; but they never seem to have been brought to any conclusion. In France, in Prussia, in Sweden, in Saxony, in Sardinia, and in Tuscany, such plans have been attempted; but with a view of ascertaining the present state, rather than the means of future improvement.

country, are now anxious to ascertain, the real state of its agriculture, its manufactures, and its commerce;—the means of improvement of which they are respectively capable—the amount of the population of a state, and the causes of its increase or decrease—the manner in which the territory of a country is possessed and cultivated—the nature and amount of the various productions of the soil—the value of the personal wealth or stock of the inhabitants, and how it can be augmented—the diseases to which the people are subject, their causes and their cure—the occupations of the people—where they are intitled to encouragement, and where they ought to be suppressed—the condition of the poor, the best mode of maintaining them, and of giving them employment—the state of schools and other institutions, formed for purposes of public utility,—the state of villages and towns, and the regulations best calculated for their police and good government—the state of the manners, the morals, and the religious principles of the people, and the means by which their temporal and eternal interests can best be promoted.

Impressed with the deepest sense of the nature and importance of the objects abovementioned, in the month of May, 1790, I circulated among the clergy of the church of Scotland, a number of queries, for the purpose of elucidating the statistical situation of my native country. Nothing could be more flattering than the reception they met with, from that learned and respectable body. Scotland is divided into about 950 parochial districts; and, in less than eighteen months, reports were received from above one-half of that number. The returns that were transmitted, also, were nor trifling or superficial; but, in general, such as might be expected, from men of extensive knowledge, and of sound abilities, acquainted with the various topics to which their attention was directed. With so much zeal, indeed, have they entered into this inquiry, that, in less than four years from its commencement, this great and extensive Survey will be nearly completed.

Astonished with so rapid a progress, and convinced that the most important and beneficial consequences must be derived from it, to mankind in general, but more especially, to these kingdoms of Great Britain and Ireland, I flatter myself, that no doubt can now be entertained in the mind of any one, respecting the propriety of carrying on a similar inquiry in the southern part of the island. The possibility of completing such an investigation has formerly been questioned, but every idea of its being impracticable, is now done away, by its success in Scotland. The clergy of the church of England, who have so long distinguished themselves by their splendid exertions in every branch of literature, will not surely suffer so favourable an opportunity to escape, of adding to their character and their fame. It is an undertaking, which, however great and laborious, they undoubtedly have the power, and I have no doubt, it will be found, they have also the inclination, to accomplish. To have their attention directed to so many important and useful objects of inquiry, will prove a greater source of pleasure and improvement, than it is possible at first to conceive: and being engaged in a great pursuit, which unites the *utile* and *dulce*, will soon appear the most pleasing of all occupations. There is now also a public institution (the Board of Agriculture and Internal Improvement) constituted, among other objects, for the express purpose of facilitating the progress of such a measure, and of bringing it as speedily as possible to a conclusion. Nor ought it to be omitted, that the Church of Eng-

land was never more happily distinguished, by learned and respectable characters, whose enlarged and liberal views, will naturally lead them to encourage such investigations.——In order to explain their general nature and tendency, and the best means of carrying them into execution, it is proposed to circulate, the annexed analysis, of the statistical account of a parochial district, or of any other territorial division, tables which may render such accounts less obscure or voluminous, and SPECIMENS OF THE ACCOUNTS OF CERTAIN DISTRICTS IN SCOTLAND, in many respects differing from each other, and including almost every possible variety.*

It is only necessary to add, that if this Survey is happily completed, and similar ones are afterwards periodically taken every fifty or one hundred years, they will furnish the best means of ascertaining the progress of national improvement, and will point out the proper system to be pursued, in order to bring political society, in these kingdoms, to the highest pitch of happiness and perfection.

* The specimens above alluded to, will be found in the Statistical Account of Scotland, and consisted of the following articles.

No. I. Specimen of a pastoral district——United parishes of Kinguisse and Inch, county of Inverness.

No. II. Specimen of a small inland agricultural district——Parish of Morham, county of East Lothian.

No. III. Specimen of a greater agricultural district, situated on the coast——Parish of Graitney, or Gretna, county of Dumfries.

No. IV. Specimen of a district where manufactures have commenced——Parish of Moulin, county of Perth.

No. V. Specimen of a district where manufactures have been established, with a view of the effects they have on the manners, the morals, and the health of the inhabitants——Parish of Nielston, county of Renfrew.

No. VI. Specimen of a town and district, with manufactures and foreign commerce——Town and parish of Montrose, county of Angus.

No. VII. Specimen of the statistical account of a large city, giving a view of the progress of arts, luxury, and refinement——City of Edinburgh, &c.

Analysis of the Statistical Account of a Parochial District, or of any other territorial Division in a Country.

Name of the district, and its origin.
Its situation and extent.
Number of acres.
Description of the soil and surface.
Nature and extent of the sea coast.
Lakes, rivers, islands, hills, rocks, caves, woods, orchards, &c.
Climate and diseases.
Instances of longevity.
State of property.
Number of proprietors.
Number of residing proprietors.
Mode of cultivation.
Implements of husbandry.
Manures commonly made use of.
Seed time and harvest.
Remarkable instances of good and bad seasons.
Price of grain and provisions.
Total quantity of grain and other articles consumed in the parish.
Wages and price of labour. Hours when labour commences and ceases at the different seasons.
Personal services, whether exacted or abolished.
Commerce.
Manufactures.
Fisheries.
Towns and villages.
Police.
Inns and alehouses.
Roads and bridges, private, parochial, or public.
Harbours.
Ferries, and their state.
Number of ships and vessels.
Number of seamen.
State of the church.
Patron, glebe, parsonage, &c.
Number of poor.
Parochial funds, expence of the poor, and mode of management.
State of the schools, and number of scholars.
Ancient state of population.
Causes of its increase or decrease.
Annual average of births, deaths, and marriages.
Number of families.
Exact amount of the number of souls now living.
Number of males.
Number of females.
Division of the inhabitants, by the place of their birth; by their residence, whether in town, in villages, or in the country; by their ages, occupations, &c.
Number of houses.
————— uninhabited houses.
Minerals in general.
Mineral springs.
Coal and fuel.
Eminent men.
Antiquities.
Parochial records.
Miscellaneous observations.
Character of the inhabitants.
Their manners, customs, stature, &c.
Advantages and disadvantages of the district.
Means by which the situation of the inhabitants can be meliorated.

It might be the means of shortening such Accounts considerably, if the information respecting a number of articles were condensed as much as possible, in the shape of a Table, according to the annexed Specimen.

STATISTICAL TABLE OF THE PARISH OF ———

Length in English miles - -
Breadth - - -
Population 40 or 50 years ago -
——— *anno* 17 - -
Increase (or decrease) - -
Average of births, ——— of deaths, ——— of marriages } for any number of years preceding 17 {
Inhabitants in towns - -
——— in villages - -
——— in the country -
Number of males - -
——— females - -
——— persons under ten years of age -
——— between 10 and 20 -
——— between 20 and 50 -
——— between 50 and 70 - -
——— between 70 and 80 -
——— between 80 and 90 - -
——— between 90 and 100 -
——— above 100 -
——— families - -
——— houses inhabited -
——— ditto uninhabited -
——— new houses built within these 10 years - -
——— old ditto pulled down -
——— married persons -
——— children, at an average, from each marriage

Number of Twins, &c. born in the parish for the last 10 years - -
——— Bachelors, or unmarried men above 50 -
——— Unmarried women above 45 - - -
——— Widowers - -
——— Widows - -
——— Males born out of the parish - -
——— Females ditto - -
——— Persons born abroad -
——— ——— in Scotland
——— ——— in Ireland
——— ——— in the Colonies -
——— Proprietors residing -
——— non-residing - -
——— Clergymen - -
——— Merchants - -
——— Physicians - -
——— Surgeons - -
——— Midwifes - -
——— Writers, or Attornies
——— Schoolmasters - -
——— Farmers under 50*l.* *per annum* - -
——— Ditto from 50*l.* to 100*l.*
——— Ditto from 100*l.* to 300*l.*
——— Ditto from 300*l.* to 500*l.*
——— Ditto above 500*l.* - -
——— Shopkeepers - -
——— Innkeepers, greater and smaller - -
——— Smiths - -

Number of Masons - -
——— Carpenters - -
——— Weavers - -
——— Shoemakers - -
——— Taylors - -
——— Butchers - -
——— Millers - -
——— Bakers - -
——— Gardeners - -
——— Male domestic servants -
——— Female ditto - -
——— Male farm servants -
——— Female ditto - -
(Add any other occupation by which a person gains a livelihood in the district.)
——— Poor - -
Property belonging to them - -
Annual income -
——— Young persons taught writing, arithmetic, &c.
——— Latin - -
——— Greek - -
——— At the university - -
——— Ships - -
——— Small vessels - -
——— Boats - -
——— Seamen - -
——— Fishermen - -
——— Persons serving in the navy during the last war. - - -
——— Ditto in the army -
Average of persons who have settled in the district during the last 5 or 10 years -
——— Ditto who have emigrated from it -
Number of acres, statute measure
——— Wheel carriages -
——— Carts - -
——— Ploughs - -

In some places the following TABLES also might perhaps be filled up, but in no case ought this to be attempted, unless it is perfectly agreeable to the inhabitants of the District.

	£. s. d.		£. s. d.
Rent, *anno* 17 - - -		Value of articles exported * - -	
—— *anno* 17 - .		——— ditto imported - - -	
Rents spent in the district - -		Balance - - -	

VALUE OF STOCK.

	£. s. d,		£. s. d.
Number of draught horses - - -	valued at	each.	Total
——— saddle and carriage horses - -	———	——	——
——— best cattle - - -	———	——	——
——— inferior ditto - - -	———	——	——
——— best sheep -	———	——	——
——— inferior ditto - - -	———	——	——
——— goats, swine, &c. - -	———	——	——
Value of carts, ploughs, and other implements of husbandry ———		——	——
		Total value of stock -	£

* It would be desirable also to ascertain the nature and amount of the articles exported and imported, as well as their value, as is done in the parish of Graitney. See Statistical Account of Scotland.

ANNUAL PRODUCE.

Crops.	Number of Acres under each.	Produce per acre. Bushels.	Price per bushel. £. s. d.	Total price per acre. £. s. d.	Total produce. Bushels.	Total value. £. s. d.
Wheat - - -						
Barley - -						
Oats - -						
Beans - -						
Peas - - -						
Potatoes -						
Flax - -						
Turnips - -						
Cabbage, &c. -		Stones	per stone		Stones	
Meadow, hay, or natural grass						
Sown grass - -						
Straw, at	per quarter of corn -					
Pasture, at	per horse;	per cow; and		per sheep		
Annual produce of gardens - - -						
——— orchards - - -						
——— woods and plantations - -						
——— fisheries - - -						
——— mines - - -						
Total value of annual produce -						

Model of Bills of Mortality, and Tables of Deaths, Births, and Marriages, as suggested by the Royal College of Physicians at Edinburgh.

BILLS OF MORTLALITY for the Parish of during the Year

TABLE OF DISEASES.

I. FEBRILE DISEASES.

	Un. 6 Ms.	Betn do.& 1 Yr.	1 & 2	2 & 3	3 & 4	4 & 5	5 & 6	6 & 7	7 & 8	8 & 9	9 & 10	10 & 15	15 & 20	20 & 25	25 & 30	30 & 40	40 & 50	50 & 60	60 & 70	70 & 80	80 & 90	90 & 100	Above 100	Total.
Intermittent Fever -																								
Continued Fever -																								
Inflam. of the Brain -																								
—— —— the Throat																								
—— —— Breast																								
—— —— Bowels																								
—— —— Liver																								
—— —— Kidneys																								
Rheumatism -																								
Croup -																								
Gout - -																								
Erysipelas - -																								
Small Pox natural -																								
Ditto inoculated -																								
Measles - -																								
Spitting of Blood -																								
Consump. of the Lungs																								
Catarrh - -																								
Dysentery - -																								
Total -																								

II. NERVOUS DISEASES.

	Un. 6 Ms.	Betn do.& 1 Yr.	1 & 2	2 & 3	3 & 4	4 & 5	5 & 6	6 & 7	7 & 8	8 & 9	9 & 10	10 & 15	15 & 20	20 & 25	25 & 30	30 & 40	40 & 50	50 & 60	60 & 70	70 & 80	80 & 90	90 & 100	Above 100	Total.
Apoplexy - -																								
Palsy - -																								
Fainting - -																								
Locked jaw -																								
Epilepsy - -																								
Hooping Cough -																								
Cholera Morbus -																								
Diarrhœa - -																								
Diabetes -																								
Canine Madness -																								
Insanity - -																								
Total -																								

III. CACHECTICAL DISEASES.

	Un. 6 Ms.	Betn do.& 1 Yr.	1 & 2	2 & 3	3 & 4	4 & 5	5 & 6	6 & 7	7 & 8	8 & 9	9 & 10	10 & 15	15 & 20	20 & 25	25 & 30	30 & 40	40 & 50	50 & 60	60 & 70	70 & 80	80 & 90	90 & 100	Above 100	Total.
Atrophy - -																								
Tympany - -																								
General Dropsy -																								
Dropsy of the Brain -																								
—— —— Breast																								
—— —— Belly																								
Tumour of the Belly																								
Rickets - -																								
Scrophula -																								
Venereal Disease -																								
Scurvy -																								
Jaundice - -																								
Total -																								

IV. LOCAL DISEASES.

Iliac Passion -																								
Suppression of Urine																								
Aneurism - -																								
Cancer - -																								
Hernia - -																								
Flooding - -																								
Abortion - -																								
Gangrene - -																								
Total -																								

V. ANOMALOUS DISEASES.

	Un. 6 Ms.	Betn do.& 1 Yr.	1 & 2	2 & 3	3 & 4	4 & 5	5 & 6	6 & 7	7 & 8	8 & 9	9 & 10	10 & 15	15 & 20	20 & 25	25 & 30	30 & 40	40 & 50	50 & 60	60 & 70	70 & 80	80 & 90	90 & 100	Above 100	Total.
Diseases unknown -																								
Casualties -																								
Dentition -																								
Gravel and Stone -																								
Worms -																								
Drunkenness -																								
Poison - -																								
Total -																								

TABLE OF DEATHS, AGES, AND CONDITIONS.

Ages.	Males.	Females.	Ages	Bachelors	Husbands	Widowers	Maids	Wives	Widows	Total	Bn in the city	Bn elsewhere	Inhabitants	Strangers
Under 1 month -			20—30											
Between 1—2 months			30—40											
2—3 - -			40—50											
3—6 - -			50—60											
6—9 - -			60—70											
9—12 - -			70—80											
1—2 years old -			80—90											
2—3 - -			90—100											
3—4 - -			100—110											
4—5 - -			110—120											
5—10 - -			120—130											
10—15 - -			Total of ages and conditions.	Total of ages under 20 yrs.						Males. Fem.				
15—20 -														
Total of the above ages				Tot. of ages and conditions										

TABLE OF DEATHS, BIRTHS, AND MARRIAGES IN EACH MONTH.

	Deaths		Births		Marriages				Total Deaths	Total Births	Total Marriages	
	Males	Females	Males	Females	Both unmar. before	Husb. mar. before	Wife mar. before	Both mar. before				
January												1st Quarter.
February												
March												
April												2d Quarter.
May												
June												
July												3d Quarter.
August												
September												
October												4th Quarter.
November												
December												
Total for the Year												

It would be extremely desirable, that the clergy in the country parishes, and some respectable physician, with the assistance of the magistrates, in towns, would regularly keep such Bills of Mortality and Tables, and would transmit them to the Board of Agriculture and Internal Improvement, at their Office in London: it might be the means of throwing much light on many important objects of political inquiry, in which the health and interests of the inhabitants of these kingdoms are deeply involved.

APPENDIX. G.

Plan of the Agricultural Surveys.

THE Board of Agriculture, will have occasion to employ some very intelligent surveyors, or persons skilled in Husbandry, in examining into the agricultural state of all the different counties of England and Scotland, and in pointing out in what respects there is room for improvement.

The inquiries principally to be made, will relate to the following points:

1. The nature of the soil and climate of the district to be examined?
2. The manner in which the land is possessed, whether by great or by small proprietors?
3. The manner in which the land is occupied, whether by great or by small farmers?
4. The manner in which the land is employed, whether in pasture, in husbandry, or a mixture of both?
5. If in pasture, what grasses are cultivated? what species of stock is kept? whether the breeds can be improved, or whether new breeds ought to be tried?
6. Whether any of the land is watered, and whether any considerable extent of ground is capable of that improvement?
7. If the land is employed in husbandry, what are the grains principally cultivated?
8. What is the rotation of crops? and in particular, whether green crops, as turnips, clover, &c. are cultivated, and how they are found to answer?
9. Whether fallowing is practised, or otherwise?
10. What manures are made use of?
11. What are the usual sorts of ploughs, carts, and other implements of husbandry?
12. Whether oxen or horses are made use of?
13. What is the usual seed time and harvest?
14. Whether the land is inclosed or in open fields?
15. What advantages have been found to result from inclosing land, in regard to the increase of rent,——quantity or quality of produce,——improvement of stock, &c.
16. What is the size and nature of the inclosures?
17. Whether inclosures have increased or decreased population?
18. Whether there are any common fields, and whether any division of them is proposed?
19. What is the difference of rent, or produce, between common fields and inclosed lands?
20. What is the extent of waste lands, and the improvement of which they are most capable, whether by being planted, converted into arable, or into pasture land?
21. What is the rate of wages, and price of labour; and what are the hours at which labour commences and ceases, at the different seasons?
22. Whether proper attention is paid to the draining of land, particularly the fenny part of it, and what sorts of drains are commonly made use of?

23. Whether paring and burning is practised, and how is it managed and found to answer?

24. Whether the country is well wooded, and whether the woodlands are kept under a proper system?

25. What is the price of provisions, and whether the price is likely to be steady, to rise, or to fall?

26. What is the state of the roads both public and parochial, whether they are in good order, or capable of improvement?

27. What is the state of farm houses and offices, whether in general they were well situated and properly constructed?

28. What is the nature of the leases commonly granted, and the covenants usual between landlord and tenant?

29. To what extent have commerce or manufactures been carried on in the district, and have they had either good or bad effects on its agriculture?

30. Are there any practices in the district, that could be of service in other places?

31. Are there any societies instituted in the district for the improvement of Agriculture?

32. Whether the people seem to have a turn for improvements, or how such a spirit could best be excited?

33. What improvements can be suggested either in regard to the live stock or the husbandry of the district?

34. Are there any obstacles to improvements, and in what manner can they best be removed?

35. What are the names, descriptions, and address of those proprietors, or farmers, who are the most active, or the most skilful improvers in the district, and who are the most likely to be useful correspondents to the Board of Agriculture?

It is proposed, for the sake of making such Surveys as easy as possible, that each person, who may undertake them, shall have a district that may be gone over in five or six weeks: so that it may be undertaken by those, who have a good deal of business of their own, without much inconvenience. Thus also the Board will have a greater variety of information, and a greater mass of instructive observations, from a greater number of intelligent men, for their consideration and guidance.

It is farther proposed, that the reports received by the Board, shall first be circulated as much as possible, in the counties to which they relate, for the benefit of receiving the observations, and additional remarks of every farmer and gentleman in the district. From the information thus accumulated, a complete state of its Agriculture will be drawn up and published; copies of which will be presented by the Board, to every individual, who may have favoured them with his assistance.

The Board can only make an allowance, at the rate of £5. per week, for the expence of such a tour. Indeed a number of persons, with great public zeal, and much to their credit, have undertaken to survey several districts gratuitously. But that is not always to be expected, particularly from professional men. The payment of their expences, they are well intitled to expect, if they give their time and trouble for nothing. Profit, however, must not be the object

of those who undertake such an employment; nor could such a Board wish to be concerned with any one, who would not willingly make some sacrifices for the public good, and indeed who would not take a pride in having any share in promoting so useful an undertaking.

P. S. If the district is remarkable for its orchards, for its cider, for its dairy, for its cheese, for its butter, for its breed of sheep, cattle, horses, hogs, &c. or the culture of woad, liquorice, &c. particular attention is requested to those articles, or to any other in which it may excel. Drawings also, and exact descriptions, of the different breeds of sheep, cattle, horses, and hogs, in each district, would be particularly desirable. The quantity raised of each sort of crop, in the different parts of the district, and the quantity of milk produced by the different breeds of cattle, or of wool by the different breeds of sheep, cannot be too accurately ascertained and noted.

APPENDIX. H.

Arrangement of the Agricultural Surveys, and the Persons by whom they were respectively undertaken.

ENGLAND.

	County.	Person.
	Norfolk	Mr. Kent.
	Suffolk	Mr. Arthur Young.
	Essex	Mess. Griggs of Hillhouse, and Mr. Charles Vancouver.
	Middlesex	Mr. Thomas Baird, and Mr. Foot.
5	Surry	Messrs. Malcolm of Stockwell.
	Kent	Mr. Boys of Betshanger.
	Sussex	Rev. Mr. Young.
	Hants	Messrs. Driver, and the Rev. Mr. Warner, jun. for the Isle of Wight.
	Dorset	Mr. Claridge.
10	Devon Cornwall	Mr. Robert Frazer, and the Agriculture Societies of Devon and Cornwall.
	Somerset	Mr. Billingsley.
	Wilts	Mr. Davis of Longleat.
	Berks	Mr. Pearce.
15	Bucks	Messrs. Malcolm of Stockwell.
	Oxon	Mr. Robert Davis.
	Bedford	Mr. Stone.
	Leicester	Mr. Monk, and the Agriculture Society of Leicester.
	Warwick	Mr. John Wedge.
20	Northampton	Mr. James Donaldson.

	COUNTY.	PERSON.
	Huntingdon - -	Mr. Stone, and Mr. Maxwell.
	Herts - - -	Mr. David Walker.
	Rutland - -	Mr. Crutchley of Burley.
	Chester -	Mr. Thomas Wedge.
25	Lincoln - -	Mr. Stone.
	Cambridge - -	Mr. Charles Vancouver.
	Durham - - -	Mr. Grainger, and the Agriculture Society of Durham.
	Northumberland - -	Mr. Bailey, and Mr. George Culley.
	Salop - -	Mr. Bishton of Killsall.
30	Stafford - -	Mr. William Pitt of Pendeford.
	Monmouth - -	Mr. Fox.
	Hereford - -	Mr. Clarke.
	Gloucester -	Mr. Turner of Dowdeswell.
	Derby - -	Mr. Brown of Luton.
35	Notts - - -	Mr. Lowe of Oxton.
	Cumberland - -	Mr. Bailey, and Mr. George Culley.
	Westmorland - -	Mr. Pringle of Balencrieff.
	Worcester - -	Mr. Pomeroy of Fairway, near Honiton.
	Lancaster - -	Mr. Holt of Walton.
40	East Riding, Yorkshire -	Mr. Leathem.
	North ditto - -	Mr. Tuke, jun.
	West ditto - -	Mr. George Rennie, Mr. Brown, and Mr. Shirreff.

WALES.

	Pembroke - -	Mr. Hassall.
	Carmarthen - -	
45	Cardigan - -	Mr. Lloyd, and the Rev. Mr. Turner.
	Radnor - -	Mr. Clarke.
	Brecon - -	
	Glamorgan - -	Mr. Fox.
	North Wales - -	Mr. George Kay.

SCOTLAND.

50	Berwick - -	Mr. Low, and Mr. Bruce.
	East Lothian - -	Mr. Buchan Hepburn.
	Mid Lothian - -	Mr. George Robertson of Granton.
	West Lothian - -	Mr. James Trotter.

	COUNTY.	PERSON.
	Dumfries -	Dr. Bryce Johnston of Holywood.
55	Galloway, both county and Stewartry	Mr. Webster.
	Ayr - -	Colonel Fullarton.
	Dunbarton - -	Reverend Mr. Ure.
	Renfrew - -	Mr. Alexander Martin of Salton.
	Argyll, and Western coasts of Inverness - -	Mr. Robson.
60	The Hebrides, or Western Islands	Rev. Dr. Walker, professor of natural history in the University of Edinburgh; and Mr. Heron.
	Stirling - -	Reverend Mr. Ure.
	Clackmannan - -	Mr. Erskine of Marr.
	Roxburgh - - -	Reverend Mr. Ure.
	Selkirk - -	Mr. Thomas Johnston.
65	Tweedale - -	
	Clydesdale - -	Mr. John Naismith.
	Carse of Gowrie -	Mr. James Donaldson.
	Monteath and Strathearn in Perthshire	Rev. Dr. Robertson of Callander.
	Kinross - -	Dr. Coventry, professor of Agriculture in the University of Edinburgh.
70	Fife - - -	Mr. Beatson of Lochgellie.
	Forfar - -	Mr. Dempster of Dunnichen, and the Rev. Mr. Roger.
	Mearns - -	Mr. Barclay of Urie, and Mr. James Donaldson.
	Aberdeen - -	Dr. Anderson.
	Banff, - - -	Mr. James Donaldson.
75	Moray - -	
	Nairn, and eastern part of Inverness	
	Interior districts in the Highlands	Mr. Marshall, author of the Norfolk Husbandry, &c.
	Ross, Sutherland, and Caithness	Sir John Sinclair.
	Orkney Isles - -	
80	Shetland Isles - -	

As the Reports transmitted to the Board, are to be printed, and very generally circulated, in the counties to which they respectively relate, previously to their being published, there is every reason to believe, that no material error can escape observation, and that every useful fact, or valuable idea, existing in the kingdom, on the subject of agriculture, will be brought forward.

A copy of the returns transmitted by the different surveyors (or the one that respects any particular county,) will be sent to the Members of both Houses, on application to the Board, by a letter directed to Sir John Sinclair, the President, at Whitehall, London. It is requested that such application may be made as quickly as possible *(as the number of copies, to be printed, must be settled accordingly)*, and that a direction be sent at the same time, how the papers are to be addressed.

APPENDIX. I.

Account of the Manner in which the Parliamentary Grants received by the Board of Agriculture, prior to the 4th of September, 1796, have been expended.

N. B. An additional £3000. was voted in April, 1796, but it was not paid on the 4th Sept. following.

				£.	s.	d.
Fees on the Letters Patent, constituting the Board	£ 712	1	0	1189	12	2
Fees on receipt of the grants	477	11	2			
Expence for the Surveys of the different counties				2171	3	6
Printing the Surveys, and engravings therein contained				3411	2	6
Postage and other incidental charges				255	6	11
Office furniture, and articles for the museum				118	19	6
Stationary				106	14	1
Salaries to officers				1660	0	0
Advertisements				77	12	4
German translations				9	9	0
				£9000	0	0

For so great an undertaking as the Survey of a whole kingdom (without adverting to the various other objects to which the attention of the Board has been directed), so small a grant as £3000. per annum, particularly deducting so large a sum as £1189. 12*s*. 2*d*. for fees of office, would have made no progress, had not about one hundred Members of the Board subscribed ten guineas each, in aid of its other funds,—had not the President supplied the Board with every accommodation that was necessary for carrying on its business, without putting it to any expence, and had not a number of individuals either gratuitously assisted the Board in drawing up the County Reports, and other papers, or executed the different tasks entrusted to them, on the most moderate terms.

It is hardly necessary to add, that none of the Members of the Board, can possibly derive the smallest advantage, from the labour they bestow in conducting the affairs of the Institution, though in a late publication an insinuation to that effect has appeared.*

* See Additional Facts on the expences of the War, &c. by William Morgan, F. R. S. p. 52. "The "Secretary and Under-secretary to the new Board of Agriculture (he observes) receive a salary. The "Commissioners, (he adds) I believe, for the most part officiate gratuitously." The fact is, that all the Commissioners, as he is pleased to call them, officiate gratuitously; and that the President, instead of receiving any thing, incurs an expence of at least 1000l. per ann. in consequence of the situation he holds, which, at the same time, is probably the most laborious of any in the kingdom. In regard to the small pittance granted by Parliament, it is to be remarked, that the greater part of it will be returned to the public and its officers, in fees of office, in postage, in duties on advertisements, but above all in duties upon paper, which, when all the Reports are reprinted, will amount to a very considerable sum.

APPENDIX. K.

Substance of Sir John Sinclair's *Address to the Board of Agriculture, on Tuesday the twenty-ninth of July*, 1794: *stating the Progress that has been made by the Board, and the Advantages that may be expected from improving the Territory of the Kingdom.*

THAT he considered it extremely necessary, for any person who filled that situation in which he happened to be placed, previous to the Annual Adjournment of the Board, to give a short statement of the business which had been transacted in the course of the Session, and of the progress that had been made in carrying on the important objects for which the Board was constituted.

That at the commencement of the present, being the first Session after its establishment, the attention of the Board had naturally been directed to the formation of those bye-laws which were to regulate its future proceedings, the original sketch of which had been drawn up with great attention and ability, by a Noble Lord (Lord Hawke), to whose zeal and assiduity the Board, in that and in other respects, had been infinitely indebted.

That a great variety of important communications had been transmitted to the Board from many quarters, both at home and abroad, on all the different topics connected with agricultural inquiry, furnishing a number of valuable hints, which might be of essential service in promoting the improvement of the country. These hints, he observed, might either be separately printed, or incorporated with the Reports of the Board. That the committee appointed " to take the Present State of the Waste Lands, and Common Fields of this Kingdom, and the probable Means of their Improvement, under their consideration," had already made great progress in that important inquiry, and he had no doubt, would, when the Board re-assembled, have a Report ready, fully explaining the ancient laws respecting the division of such lands, and the best means of facilitating them in future; and that the Board was already in possession of a very interesting and able paper, drawn up by one of its members (John Robinson, Esq. surveyor-general of the woods and forests), which had thrown much light upon that subject.

Above all, that the progress made in the Agricultural Survey of the Kingdom (the basis of all the measures which the Board might think it advisable to recommend to the attention of the public) had surpassed the most sanguine expectations. The whole kingdom had been assigned in districts to different surveyors, from each of whom a separate Report was required. Such a plan had never been formerly attempted in any country; and many doubts were entertained whether it would be possible to effect it even in Great Britain, in any reasonable space of time. He had the pleasure, however, of acquainting the Board, that seventy-four Reports had been already given in, and were either printed or now in the press, and that the remainder were in such a state of forwardness, that they might soon be expected; and, consequently, within twelve

months from the Establishment of the Board, this great object would be completed. That to the credit of the Gentlemen who engaged in this laborious undertaking, a considerable number of them would accept of nothing for their trouble, and the remainder were satisfied with sums, in general, scarcely adequate to the expences they had incurred. That the Reports they had given in, were not to be considered as complete Systems of Husbandry, but merely as Chapters of a Great Work, distributed at present, as affording the readiest means of collecting farther information. That the circulating of 80,000 Papers, on so popular a subject as that of Agriculture, must have a strong tendency to direct the public attention, in a very peculiar manner, to that object; which, indeed, had already sufficiently appeared, from the anxiety to procure those Papers, and from the demand which had lately arisen for Works on Agriculture.—That about 100 Reports had been already received back, the margins of which were filled with many valuable hints and observations. That he had no doubt a considerable number of the Reports in circulation would be returned with remarks of equal merit. The Board would thus have under its inspection at once, not only very interesting accounts of the present State of the Kingdom, and a complete collection of all the past skill and experience of which the country was possessed, in matters of Husbandry, but probably every suggestion that the kingdom was master of, respecting the means or its future improvement: "a mass of useful information, of which it "cannot with justice be asserted, that any other nation has ever yet been possessed."

In regard to the use that ought to be made of the information thus accumulated, by the labour and exertions of so many active and intelligent Individuals, there are two points which he begged leave to submit to the consideration of the Board. First, that they ought not to suffer the public attention to waste itself, previous to their communicating that information to the Country; and, secondly, that instead of frittering away the valuable treasure they have thus obtained, in partial Reports, they should endeavour to condense it into one Great System.

To explain more fully to the Board the idea which he had formed of a General Report, he had drawn up a Plan, stating the various subjects to be treated of in it, and the order in which they might be arranged, and which he flattered himself it would be possible for the Board to complete, in the course even of the ensuing Session.

PLAN of a GENERAL REPORT, on the Present State of the AGRICULTURE OF GREAT BRITAIN, *and the Means of its Improvement: to be laid before his* MAJESTY, *and both* HOUSES OF PARLIAMENT, *by the* BOARD OF AGRICULTURE.

Introduction, and Plan of the Report.

Chap. 1. General View of the Natural Advantages possessed by Great Britain, for carrying on Agricultural Improvements.

Chap. 2. State of Property in the kingdom—Lands held in Severalty, or in Common—Size of Estates—Advantages resulting from a diversity of landed property, in point of extent.

Chap. 3. Mode of Occupation, in Woods—Plantations—Pastures, natural or artificial—Arable Land—Gardens—Orchards—English Husbandry, or the union of Improved Stock and Skilful Culture.

Chap. 4. Manner of Cultivation—Land cultivated by the Owner—Lands let—On the proper Size of Farms.

Chap. 5. System of Connection between the Landlord and the Tenant, or Leases and the Covenants in them.

Chap. 6. Rent, whether payable in Money, in Kind, or in Personal Services—whether Taxes are paid by the Tenant, or otherwise—Of taking Fines.

Chap. 7. Buildings on a Farm and their Repairs, with observations on the accommodations necessary for a Farmer.

Chap. 8. Wages of Servants—Price of Labour; whether by the day or the piece—Cottages.

Chap. 9. Inclosures, their nature and advantages.

Chap. 10. Draining, whether surface or under draining.

Chap. 11. Live Stock. 1. Sheep. 2. Cattle. 3. Horses. 4. Hogs, &c. with Engravings of the different Breeds.

Chap. 12. The Dairy and its Productions.

Chap. 13. Implements of Husbandry, and Engravings of the best kinds.

Chap. 14. Oxen, and their use in Husbandry.

Chap. 15. Manures, whether of a mineral, vegetable, or animal nature.

Chap. 16. Rotation of Crops adapted for the different soils.

Chap. 17. Comparison between the Drill and Broadcast Husbandry, and on Dibbling.

Chap. 18. On Fallowing, and the extirpation of Weeds.

Chap. 19. Culture of the different kinds of Grain, and the soils for which they are respectively best calculated.

Chap. 20. Harvesting, and the best means of preserving Grain and Roots, either from the inclemency of the weather, or from vermin.

Chap. 21. Culture of Green Crops.

Chap. 22. Culture of Artificial Grasses—whether pastured on, cut green, or converted into hay, and on the best mode of preserving Herbage.

Chap. 23. Crops not generally cultivated, as Hops, Hemp, &c. &c. and the Culture of Plants for Dying, for Medicine, &c.

Chap. 24. Husbandry of the Fens, including Paring and Burning.

Chap. 25. Natural Meadows and Pasture, and the proper mode of managing them.

Chap. 26. Embankments.

Chap. 27. Watering Land, or Artificial Meadows, and a comparison between them and other Pastures, in regard to quantity and quality of Produce.

Chap. 28. Gardens and Orchards, and the diseases incident to Plants.

Chap. 29. Woods and Plantations.

Chap. 30. Of Waste Lands, and the means of their Improvement, whether by rendering them Arable—converting them into Water Meadows, or Pasture, or into Plantations.

Chap. 31. Of the proper System to improve Waste Lands, either by private individuals, or public companies: with a view of increasing the population, as well as the produce of the country.

Chap. 32. Roads, Public and Parochial; and Navigations connected with Agricultural Purposes.

Chap. 33. Markets, domestic and foreign; and on the advantages of establishing a uniformity of weights and measures.

Chap. 34. Effects of commerce, manufactures, and fisheries, on Agriculture, and the advantages of their union together.

Chap. 35. Of manufacturers residing in the country, and being occasionally employed in the cultivation of the soil.

Chap. 36. Of the poor, and the means of employing them in the operations of Agriculture.

Chap. 37. The corn laws, and on the policy of encouraging a surplus of grain for exportation, after supplying the consumption of the country.

Chap. 38. Of Agricultural legislation and police.

Chap. 39. On the price of provisions, and the laws for encouraging the sale, or manufacturing the produce of the country.

Chap. 40. Miscellaneous observations.

CONCLUSION.

Chap. 1. Obstacles to improvement, and the means of removing them.

Chap. 2. Hints of improvement from foreign countries.*

Chap. 3. Means of exciting a spirit of industry and improvement in the labourer, the farmer, and the landlord: and whether public encouragements are necessary for that purpose.

Chap. 4. General view of the Agricultural produce of the kingdom.

Chap. 5. Resources of the nation, from the farther improvement of its stock and territory.

In order that the General Report might not be drawn out to too great a length, it is proposed that an Appendix shall be annexed to each chapter, for the purpose of containing a number of facts and observations, which, though tending to illustrate the subject treated of, might, in the opinion of some, be considered of a less interesting nature.

That besides the General Report, it would be expedient to reprint and to publish, the various Agricultural accounts now in circulation, with every possible correction and improvement, and in such a form, that every individual may have it in his power to purchase, on reasonable terms, either the account of his own particular county, or the Reports relating to all the different counties, or the General Report on the State of the Kingdom at large, as he may find most desirable.

* Many useful hints may be got from other countries; at the same time it is certain, that even foreigners acknowledge, it is to England that the revival of Agriculture is to be ascribed.—See the French Encyclop. voce *Agriculture*, where, on the authority of the Marquis de Mirabeau, we are told, "Les Anglois, *auxquels on doit le retablissement de l'Agriculture en Europe*, comprirent les premieres, qui l'art que etoit le fondement de tous les autres, etoit le pivot sur lequel devoit rouler le commerce."

The Spanish writers are not less sensible of this truth. A very ingenious gentleman of that country, Don Joseph Valcarcel, of the city of Valencia, seems well convinced of the fact. "It must be acknowledged, (says he) that England has opened the eyes of other nations. Those islanders, whose natural melancholy renders them pensive, after trying so many schemes to become powerful, have discovered at last, that it is Agriculture alone which forms the source and origin of their greatness. They have added wings to this science, by Agricultural laws, which have been further encouraged by premiums. If on this principle we were to calculate the progress of that monarchy, we shall find their power to have increased in a threefold degree, and that their force has augmented in proportion to its improvement." *Agricultura General, por* Don Jos. Valcarcel: Valencia, 1765, Tom. i. p. 55.

He could not conclude, without attempting to give, even in this early stage of their proceedings, some general idea of the public benefit to be derived from the improvement of the territory of the country.

It is not difficult, even on such data as have been already obtained, to make calculations sufficiently accurate for every useful purpose, respecting the probable advantages to be expected from the improvement of the kingdom, in regard to income—capital—and population: and perhaps a short statement of such advantages, may awaken more the public attention, and be more satisfactory to the generality of the people, than long disquisitions. He had, therefore, embraced the earliest opportunity, of throwing together some ideas upon the subject, for his own private satisfaction, and for the consideration of the Board and of the public.

Of the different Reports given in to the Board, that from the county of Cambridge is by far the most minute, the surveyor having, with great labour, gone from parish to parish, and in general having obtained sufficient information, in regard to stock, produce, and population. At the conclusion of his Report, he recapitulates the increase of rent which may be expected, by improving the cultivation of 319,300 acres in that county, of which the following is an abstract.

Number of Acres.	Description of the Land.	Increased Rent per acre.	Total Increase.
150,000	Waste and unimproved Fen	£ 0 10 0	£ 75,000 0 0
132,000	Open and Common Field Arable Land	0 8 0	52,800 0 0
19,800	Inferior Pasture	0 9 7	9,487 10 0
7,500	Of Upland Common	0 11 0	4,125 0 0
8,000	Of Fen Common	0 10 0	4,000 0 0
2,000	Of ½ yearly Meadow Land	0 8 6	850 0 0
319,300	At an average about 9*s.* per acre.		£ 146,262 10 0

That it seemed to him impossible to contend, that these rents are exorbitant, or beyond what any tenant would be willing to pay for the advantage of having his land drained, inclosed, and put in a state of improvement. This seems, therefore, a fair foundation, on which the following calculations may be built.

That the above increased rent, it is evident, can only arise from increased produce, or decreased expences, but principally from the former; and it is not unreasonable to say, that the tenant ought to have of increased produce alone, thrice the increased rent, or, in the county of Cambridge, deducting smaller sums, £438,000. per annum.

That to prove this is a low calculation, it is sufficient to remark, that stating the additional produce of 319,300 acres at £438,000. is only at the rate of about £1. 7*s.* per acre, which surely cannot be called too high an estimate.

That in order to judge what addition this would make to the national capital, the increased produce ought to be multiplied by thirty;—hence the total value, at thirty years purchase, would amount to £13,140,000.

That in the view of additional population, the result is equally satisfactory. According to the common calculation, £10. at an average, is sufficient for every human being, men, women, and children included; consequently £438,000. of additional produce would furnish subsistence to 43,800 additional inhabitants.

The general result, in regard to Cambridgeshire, is then as follows:

Number of acres to be improved, - - - -	319,000
Addition of rent, at the average of about 9*s*. per acre, - - -	£146,262
Additional produce, at £1. 7*s*. per acre, - - - -	£438,000
Addition to the national capital at 30 years purchase of the produce, -	£13,140,000
Probable increase of population, - - - -	43,800 souls.

That, for the purpose of calculating the extent to which improvements may be carried in the kingdom at large, it is necessary to state, that according to the computation of the celebrated Dr. Halley, Cambridgeshire is a 70th part of England and Wales, consequently the above results are to be multiplied by seventy, in order to ascertain the improvable value and population of the southern part of the United Kingdom. The result of that calculation would be as follows:

Number of acres to be improved, - - - - -	22,351,000
Addition of rent, at the average of about 9*s*. per acre, - -	£10,057,950
Additional produce, at £1. 7*s*. per acre, - - - -	£30,173,850
Addition to the national capital, at 30 years purchase of the produce -	£905,215,500
Probable increase of population - - - -	3,017,385 souls.

That of the number of acres to be improved, namely, 22,351,000. one half probably consists of waste lands, and the other half of common fields, and lands under defective cultivation; and that great as would be the benefit to be derived from the improvement of the former, it was the latter from which the greatest expectations of solid advantage were to be entertained.

That doubtless there would be some, who, unaccustomed to such calculations, or perhaps from despondency of temper, might be inclined to question them. They may probably say that one district is too small a foundation, on which to build so great a superstructure: that Cambridgeshire has an unusual proportion of wastes and common fields, and consequently cannot furnish fair data for such a calculation, &c. &c. To this it may be sufficient to answer, that in such cases, minute exactness is not to be looked for. That to be enabled to form some general idea of the nature and extent of public improvement, is a great step gained.

That from every information which the Board of Agriculture has as yet been able to procure, there are at least twenty-two millions of acres, partly waste, and partly already in cultivation, which may be made to yield an additional produce of £1. 7*s*. per acre. That the above calculations are confined to South Britain; and that one-sixth more, at least, might have been added for North Britain, had there been any wish to make exaggerated estimates: and that as much of the additional produce will consist of wool, hides, and other raw materials, which will employ many hands, and the value of which will be trebled by being manufactured, it is impossible that the above statement can do justice to the additional wealth and population of the country, resulting from a general improvement of the soil; more especially, when the

improvement of the live stock in the kingdom is taken into consideration, from which so much additional advantage may be expected.

Another objection which may be urged, is, that no deduction is made on account of the expence of these improvements.—That is undoubtedly a circumstance intitled to the attention of those private individuals, by whom such improvements are to be made; but in a national account, it is not an object for consideration. The public pays for none of these improvements: though John should employ Thomas to survey a waste, to inclose a common field, to build a new house for a farmer, or to raise new plantations, the public, instead of losing, would gain by the expenditure. The money thus laid out, might have lain dormant in the coffers of a banker, might have been wasted on foreign luxuries, might have been employed in manufacturing articles for foreign markets, which were never paid for; or might have been destined for the cultivation of distant territories, with all the risk of being taken from us by an enemy, on declaring themselves independent. How different is the result, when our money is laid out at home, and employed in a manner, in every possible point of view, so peculiarly beneficial. The improvements of our own land cannot be taken from us. They require no additional troops to defend them, nor fortresses to be reared for their protection. But if any person should incline to consider the money expended in carrying on the amelioration of our own soil, as so much national loss, let him state the expence at the sum of £4. per acre, which is certainly sufficiently high, (for the first crops, after any field is improved, are in general so luxuriant as to repay all necessary expences) and even then, ample inducements for improving will still remain.

The expence of improving 22,351,00 acres, at £4. per acre, would amount to - - - - - - - £89,404,000

Interest thereof at five per cent. - - - - - £4,470,200

These sums are to be deducted from £905,215,500. of additional national capital, and £30,173,850. of additional national income.

That here it was impossible not to advert to the astonishing difference between expending eighty-nine millions in improvements at home, or in foreign conquest. After the expenditure of that sum in war, it would be accounted a most fortunate means of reimbursement, if we could secure any territory, by a commercial intercourse with which, five millions per annum could be gained; whilst, at the same time, it would be necessary to pay at least five millions of additional taxes. But if that money were laid out at home, or rather, if private individuals were encouraged to expend a part of their wealth and capital in the internal improvement of the country, instead of new taxes being necessary, the old ones would become lighter, and more easily paid, and instead of dragging five millions per annum, from an enormous distance, and consequently with much risk and expence, thirty millions would be produced within our own domain, and always at our command. That these were truths which had been often vaguely talked of, and consequently made little impression, but which were now likely to be probed to the bottom, and established beyond a doubt.

He should conclude with remarking, that, with such a prospect of public prosperity resulting from the labours of the Board, he was persuaded every member of it would persevere with alacrity and zeal, in completing the great undertaking in which they were engaged: the effect of

which would be felt and remembered, whilst any vestige of civilization, of useful industry, or of political happiness, could be traced in Europe.*

APPENDIX. L.

Substance of Sir John Sinclair's *Address to the Board of Agriculture, on Tuesday the 14th of July,* 1795.

Stating the Progress that had been made in carrying on the Measures undertaken by the Board, for promoting the Improvement of the Country, during the second Session since its Establishment.

Ye generous Britons, venerate the plough;
——So with superior boon may your rich soil,
Exuberant, Nature's better blessings pour
O'er every land, the naked nations clothe,
And be th' exhaustless granary of a world! THOMSON'S SPRING.

THAT he could not think of their separating for the summer, without laying before the Board, according to the practice of last year, an abstract of their proceedings, at the conclusion of what ought properly to be accounted their second Session, only one Meeting having been held in 1793, when the Board was originally constituted.

That nothing could give him greater satisfaction, than to observe the progress which the Board was making, towards completing the great measure which it had at first undertaken, namely, that of ascertaining the Present State of the Agriculture of these Kingdoms, and the Means of its Improvement. That not only the rough draught of the Survey of each County,

* The following is an abstract of the Agricultural State of Warwickshire (known to be one of the best cultivated counties in England) as reported to the Board of Agriculture.

	Acres.
Land in tillage—Wheat, 25,700—Fallow, 15,000—Turnips and Vetches 15,000—Barley, Oats, Beans, &c. 41,500—Tillage lands grazed, 45,000—Ditto in Grass, and mown for Hay, 12,330. Total - - - - - - - - -	154,530
Gardens 4000—Meadows 82,000—Woods, Canals, and Rivers, 50,000 - -	136,000
Roads supposed to be - - - - - - - - -	10,470
Open fields, 57,000—Pasture and feeding lands, 150,000—Waste lands 110,000 -	317,000
	618,000

On the supposition that only £1. 7s. could be obtained from 317,000 acres of improvable land, and 10s. of additional produce from 154,530 acres under tillage, which might certainly be expected from abolishing fallows, &c. the result would be, £505,215. and as Warwickshire is a 60th part of England and Wales, the total additional produce of the southern part of the kingdom would, on that supposition, be £30,312,900. per annum.

with hardly any exceptions, (and those would soon be supplied,) had been printed, but that the reprinting of the Reports had also commenced, from which it would appear what progress had been made in collecting additional information. The reprinted Report of Lancashire, which was now ready for publication, would fully explain the Plan according to which those Reports were in future to be drawn up. From an examination of that Report, the public would see, to what a pitch of perfection, Agricultural knowledge was likely to be brought, by the accumulation of so many valuable materials.

That next to collecting information, the Board was naturally anxious, to excite a spirit of improvement; a spirit which could best be roused, by pointing out to the Legislature those obstacles which prevented Agricultural industry, and by endeavouring to prevail upon Parliament to remove them. When the Reports were completed, it might be expedient for that purpose to draw up an Abstract of the whole, adhering to the division by Counties, but restricting the information to those points which were of general importance. That Report, which it would be proper to lay before his Majesty and both Houses of Parliament, would state such measures as seemed to be the most likely to rouse a spirit of Agricultural Exertion. He hoped that important work would be completed, before the ensuing Session of Parliament was brought to a conclusion.

The third object, that of drawing up a General Report, in which each subject connected with Agriculture should be distinctly treated, had also made considerable progress. Several of the chapters were already drawn up; and the Fifteenth Chapter, on the great subject of Manures, was printed, and in circulation. That Chapter fully explained the nature of the proposed Report, and the manner in which it was intended to be executed.

Among the duties of the Board of Agriculture, there was none of more real importance, than that of bringing under the consideration of Parliament, such measures as were likely to promote the interests of every description of persons connected with husbandry, more especially those of the lower orders of Society. With that view, a Bill was brought into Parliament, on the recommendation of the Board, which had passed into a Law, and was likely to prove of much consequence to that valuable class, the Common Labourers, who were intitled to the peculiar attention of the Legislature, and to the protection of the Board, in enabling them to lay out their little pittance to the best advantage, and without the risk of imposition.*

That a most important, but at the same time a very delicate branch of duty, incumbent upon the Board, is that of submitting to the consideration of Parliament, the claims of those, who merited to be rewarded, on account of discoveries advantageous to Agriculture. That any attempt of that sort, it might easily be supposed, was liable to many difficulties. That the Board had succeeded, in its first application, in behalf of a very deserving individual, Mr. Joseph Elkington, who had carried the art of Draining Land to a perfection hitherto unknown, and which, if spread over the whole kingdom, must necessarily prove the source of infinite public benefit. That sum, being the first ever granted by Parliament for any discovery of importance to Husbandry, rendered it more valuable to the person who received it, and more creditable to

* This Act, which was recommended to the attention of the Board by Sir Christopher Willoughby, one of its members, and was introduced into Parliament by Mr. Powys, is intitled, "An Act for the "more effectual Prevention of the Use of defective Weights, and of false and unequal Balances."

the Board, in consequence of whose recommendation it had been obtained. That the Board had this day appointed a Committee, for the purpose of attending to that subject, during the recess; by whose exertions, he had no doubt, considerable progress would be made, in the course even of this year, in having those individuals taught, who might be sent with that view to Mr. Elkington.

That there is no duty more incumbent on a Board of Agriculture, than that of recommending such measures, as are the most likely to provide a sufficient quantity of food for the People: recommendation, it is well known, is all that a Board possessed of such limited powers can attempt; but in that respect, it fortunately seems to be possessed of considerable influence. The deficiency of the last crop, becoming too apparent at the commencement of this year, an Extraordinary Meeting was held to take the subject into consideration, when the Board resolved, to recommend the Culture of Potatoes, as in every point of view the resource the easiest to be obtained, and the most to be depended on. By accounts received from various parts of the Island it appears, that the recommendation had been attended with the best consequences. There is every reason to believe, that perhaps 50,000 additional acres of Potatoes, have been planted in consequence of that recommendation. As each acre of Potatoes, will feed, at an average, from eight to ten people for twelve months, it is probable that the Board have been the means of raising as great a quantity of that food, as will maintain nearly a million of people for six months, and consequently it will have been the happy instrument, of preventing the risk of scarcity or famine during the ensuing season. For the purpose of increasing that culture in future, and of ascertaining the principles on which it could best be conducted, a Report has been drawn up and printed, which contains all the information that could be collected in Great Britain or Ireland, and from foreign publications, on the subject of Potatoes.

That for many years past, constant complaints have been made, of the increasing price of provisions. Many causes have been assigned for such a circumstance, and many remedies suggested; but the most effectual one undoubtedly is, that of cultivating the many millions of acres now lying waste and unproductive. That to that point he should take the liberty of calling the attention of the Board early in the course of the ensuing Session; and in the interim he trusted, that the members of the Board would pay every possible attention to the subject.

" Let us cut off those legal bars,
" Which crush the culture of our fruitful Isle.
" Were they removed, unbounded wealth would flow,
" Our wastes would then with varied produce smile,
" And England soon a second Eden prove."

The last, and perhaps the most important object, to which the attention of the Board can be directed, is that of attending to the situation and circumstances of the lower orders of the people. That important branch of our duty had not been neglected during the course of the present session. In addition to the specific measures above alluded to, a Special Committee was appointed to take the general subject into consideration, who have laid the foundation, by their investigations, for very important regulations in regard to that great branch of political economy. A matter of that importance, however, requires much deliberation, before either Parliament can

be applied to, for new laws, or any recommendation can be submitted to the consideration of private individuals. But there were three points, which seemed to meet with a very general concurrence. The first was, to promote Improvements in the Construction of Cottages, more especially to ascertain the means by which the consumption of fuel could be diminished. The second, to recommend the annexing of a large garden to each cottage, by which the labourer, with the assistance of his family, might be enabled to raise a considerable quantity of provisions, without being obliged to go to market for every thing he had occasion for. Many instances of the benefit resulting from such an appendage were stated in the different County Reports, and were known to many members of the Board. The third point was, that of encouraging, by every possible means, the Extension of Friendly Societies, that most fortunate of all institutions for the benefit of the poor, and the most likely means, that could possibly be devised, for rendering their situation comfortable.

That the variety of important subjects, regarding which it was necessary for the Board to collect information, and of measures which it might have occasion to recommend to the public attention, having rendered it extremely desirable, to establish a correspondence with some respectable body in each county, it had occurred, that either the Grand Juries, or the Magistrates assembled at the quarter sessions, were in every point of view, the fittest and most respectable description of persons for the Board to correspond with. That a circular letter had been sent by the Board, suggesting the many public advantages that might be derived, by establishing a committee of the magistrates in each county, to correspond with the Board upon such subjects, which there is every reason to believe will be cordially acceded to; a most desirable circumstance, as such an intercourse could not fail to be productive of consequences equally satisfactory to the Board, and important to the general interests of the country.

The President then concluded his Address in the following words:

On the whole, the Board have only to persevere, with zeal and alacrity, in the great course in which they are now engaged, in order to effect objects, which were never compassed in any other country; and which, without an institution, carried on with such zeal and energy, would never have been supposed attainable. And in carrying on this great undertaking, we ought to consider, that we are not only labouring for ourselves and our posterity, and for the nations by whom we are surrounded, who must profit from our instructions, and be benefited by our example, but that we are laying a foundation for the future prosperity and happiness of the human race; since their prosperity and happiness must ever depend, on the facility with which their means of sustenance can be provided. This country has much to boast of.—In the arts of war it has had few equals: in commerce and manufacturing industry, it has gone beyond all competition: in every branch of learning, it has produced individuals, who can rival the proudest names that antiquity can exhibit: *and if in addition to those other sources of fame and credit, it can bring Agriculture, and the useful arts connected with it, to perfection,* (which by the exertions of this Board can hardly fail to be speedily accomplished,) where is the nation that will be able to make a more distinguished figure, in the page of history?

APPENDIX. M.

Sir John Sinclair's *Address to the Board of Agriculture, on Tuesday, the twenty-fourth of May*, 1796.

Stating the Progress that had been made by the Board, during the third Session since its Establishment.

Igitur et de cultura agri præcipere, principale fuit, etiam apud exteros; siquidem et reges fecere, Hiero, Philometor, Attalus, Archelaus, et duces Xenophon, et Pœnus etiam Mago; cui quidem tantum honorem senatus noster (Romanus) habuit, Carthagine capta; ut cum regulis Africæ bibliothecas donaret, unius ejus duo de triginta de agricultura volumina, censeret in Latinam linguam transferenda, cum jam M. Cato præcepta condidisset, peritisque linguæ Punicæ dandum negotium, in quo præcessit omnes vir clarissimæ familiæ D. Syllanus. PLIN. Hist. Mund. L. XVIII. c. 3.

GENTLEMEN,

As it will probably be extremely difficult, to procure again a sufficient attendance of the Members of the Board, at this season of the year, and during the bustle of a general election, I think it may not be improper, to take the opportunity of this meeting, briefly to state the progress we have made, since I last had the honour of addressing myself to you, at the conclusion of the preceding session.

It is on all hands acknowledged, that the exertions of the Board of Agriculture last year, in promoting an extra cultivation of Potatoes, was attended with the happiest consequences, the beneficial effects of which (both the culture and use of that valuable root having thus been greatly extended) will probably long be felt, when the circumstance from which it originated may be forgotten. In fact, in times of scarcity and distress, there is no article comparable to Potatoes.—They will grow in the poorest soils; they can be taken up in detail as they are wanted; they require no manufacture of drying, milling, &c. previous to their being used; and they can be prepared in various ways for consumption. Above all, it is to be observed, that there is a space of perhaps four months, which generally is supplied from the old stock, but in times of scarcity must be taken from the new crop. That is a circumstance of less consequence where spring corn is the food of the people (but even there it is desirable to thrash the corn in winter rather than in spring, as the straw is better for the cattle): but where the people live upon wheat, which is sown in autumn, the case is otherwise; and it is impossible to say what distress it might occasion (when there is no old stock of wheat in the country) unless the aid of such an article as Potatoes can be obtained, if the farmer is obliged, in a hurried and destructive manner, to thrash corn, both for seed to himself, and food for the public. He might be tempted, indeed, by the high price of grain for food, to delay sowing his seed, until the favourable season has elapsed, in which case it is impossible to say what damage would ultimately result from it.

The Board not having yet obtained the privilege of franking, its correspondence is much more limited, and less regular than it ought to be, and is attended with a degree of trouble and inconvenience to the person who presides at it, of which it is difficult to form an adequate

conception. In consequence, however, of the want of this privilege, so essential to a public institution, and the great restrictions recently imposed upon the privileges enjoyed by a Member of Parliament, it has been found impossible, to keep up that extensive and regular correspondence, and to produce that extent of information, from which the public might derive so many important advantages. By the active zeal, however, of many friends to the institution, information was at a very early period sent to the Board, containing rather unfavourable accounts of last year's crop of wheat. I thought it a duty, therefore, incumbent upon me, to make use of every degree of influence, which my situation as President of this Board gave me with the public, to recommend, in the strongest manner, an extra cultivation of wheat last autumn. My letter upon that subject, dated 11th September, 1795, was sent to all the Members of the Board, was transmitted to the quarter sessions of the different counties, and was printed in above fifty different newspapers. It is with much pleasure I add, that the recommendation was attended with more extensive consequences than could well have been expected. From all parts of the kingdom intelligence has been received, that a greater quantity of wheat was sown last autumn, than perhaps at any period in the memory of man; and should the ensuing harvest prove favourable, this kingdom will be as well stocked with grain as it was some years ago. At any rate, by these measures, much risk of an immediate scarcity seems to be obviated.

The high price of corn, at the commencement of the last session, naturally directed the attention of Parliament, to consider the best means, not only to remedy the present distress, but to prevent it in future.—For attaining the first object, a Select Committee was appointed, known under the name of the Corn Committee, whose anxious zeal to do every possible justice to the great subject referred to their consideration, merits the utmost praise. The measures recommended by that Committee, have since been considered unnecessary by some individuals, in consequence of the price of grain having had a temporary fall.—But it will probably yet appear, that had it not been for the earnest recommendation of that Committee, to economize the consumption of bread, to use other kinds of grain as substitutes for wheat, and to encourage the importation of foreign corn by bounties of uncommon magnitude, the price of grain would not probably have decreased, and complaints would have been made of the inattention of Government to the distresses of the country. A more serious ground of accusation than an over anxiety, which, at all times, particularly in regard to so critical a matter as the subsistence of the people, is at least excusable, but on the present occasion, was not only necessary, but has proved extremely beneficial.

It was a matter, however, of still greater importance, to prevent, by some great and effectual measure, the risk of scarcity in future, and our being under the disgraceful and fatal necessity, not only of depending upon foreign grain for our subsistence, but also of encouraging its importation by high bounties. With that view, in consequence of the directions of this Board, I had the honour of moving in Parliament, for the appointment of a Select Committee, to take into its consideration the means of promoting the cultivation and improvement of the waste, uninclosed, and unproductive lands of the kingdom. The passing of a general bill of inclosure, though long ardently wished for, has hitherto been attempted in vain, and by many was held to be impracticable. By the exertions, however, of the Select Committees, to whom the drawing up the bill, and the consideration of the whole subject was referred, a bill has at last been prepared, which in the

opinion of many intelligent persons, conversant in that subject, is fully adequate to the object in view: and had not the last session been closed rather earlier than was expected, it would probably have received the sanction of the Legislature this year. I trust, however, that the first session of the ensuing Parliament, will have the credit of completing this important and valuable system, on which the future subsistence of the country depends. It is not likely at least to fail, if it can be effected by the exertions of the Board of Agriculture.

Another measure recommended by the Board, of infinitely less importance, but at the same time beneficial to the agricultural interests of the country, has already passed. I allude to the exemption of linseed and rape cakes from duty, by an act of last session, 36 Geo. III. cap. 113.* The first article, linseed cake, is of considerable importance to the feeders of cattle, and may be had, it is supposed, in abundance, from America; where a great quantity of linseed oil is made use of in painting their wooden houses. The refuse, known under the name of linseed, or oil cake, is of little value there, in consequence of the superabundance of other kinds of provision for cattle. Nothing would be more desirable, than thus to establish a new source of trade, beneficial to two countries, inhabited by a race of men, speaking the same language, descended from the same common origin, and who ought to consider themselves as the same people.—As to rape cake, it is found to be a valuable manure in many parts of this kingdom. Considerable quantities of this article, it is supposed, may be obtained from the continent of Europe; and since this regulation has taken place, rape will probably be cultivated in America. Were Russia also to devote some part of her boundless territories to the culture of that plant, the foundation of a commerce might be laid, advantageous to both empires.

In regard to collecting and circulating agricultural information, the true foundation of all those various improvements, which, under the auspices of the Board, will probably be effected, considerable progress has been made. The general views of the agricultural state of the different counties, with the exception of two small districts in Scotland (Clackmannan and Kinross), a part of each of which is already printed, have been completed. The corrected Reports of Lancashire, Norfolk, Kent, Staffordshire, and Mid-Lothian, are published; and those of several other counties are almost ready for the press. A valuable addition has been made to the printed paper on Manures. The sketch of a Report on a point which has of late been much discussed; namely, the size of farms, has also been printed, and throws much light upon that subject. A valuable communication from Lord Winchelsea, on the advantage of cottagers renting land, was ordered to be printed, with the unanimous approbation of those who had the satisfaction of being present when that paper was read to the Board.

It is impossible in this short abstract of our proceedings, to give any idea of the numerous communications transmitted to the Board, or of the various points to which its attention has been directed. Its experiments in regard to the composition of bread, and information transmitted to it upon that subject, would of itself have been sufficient to have occupied the full attention of many Societies. The perfection to which the manufacturing of barley flour has been carried under the auspices of this institution, is a discovery of great importance, as it is thus ascertained, that from the meal of pearl or pot barley, bread may be made, in taste and colour, and probably in nourish-

* Intitled, An Act for allowing the importation of Arrow Root from the British plantations, and also of Linseed Cakes and Rape Cakes from any foreign country, in British built ships, owned, navigated, and registered according to law, without payment of duty.

ment, little inferior to that of wheaten flour; and that in the proportion of at least one-third, such meal may be mixed with the produce of wheat so as hardly to be distinguished. A very general correspondence has been established, for the purpose of ascertaining the price of stock, both lean and fattened. Experiments on a great scale, under the directions of that able chemist Dr. Fordyce, are now carrying on at Gubbins in Hertfordshire, the seat of Mr. Hunter, for the purpose of ascertaining the principles of vegetation, and the effects of manures; and steps are now taking, in order to procure such information respecting the various sorts of live stock in the kingdom, as will enable us to give, in the course of next year, complete information to the public upon that important subject.

I have ever considered it to be a wise principle for the Board to adopt, not to print books for reference, but books for use; not massy volumes on a variety of different subjects, beyond the income of the generality of the people to purchase, or their time to peruse; but, if possible distinct publications, each of them on one article, exclusively of every other, avoiding the intermixture of various topics, and districts in the same work. It would also be desirable, that no paper should be published by the Board, until it has first been printed, circulated among all those who are likely to correct and improve it, and thus brought to some degree of perfection previous to its publication. Agriculture, though often treated of, has hitherto never been discussed; and it can never be much improved, until information respecting it has been collected from all quarters, has been afterwards thoroughly canvassed, and has ultimately been condensed and systematized. Such, however, has been the great number of communications transmitted to the Board upon various important subjects, in particular Farm Buildings, Cottages, and the State of the Poor, Embankments, Roads, the Constructions of Mills, and of Hand-mills in particular; together with a variety of interesting papers respecting the agriculture of foreign countries, that the Board has resolved to print a specimen of those papers, in one volume quarto, in order to ascertain the opinion of the public respecting that mode of laying before it, the papers we have received, in addition to the County Reports now publishing.

The business gone through by the Board of Agriculture, is certainly more than could possibly be expected, from an institution possessed of such limited powers, and of so confined an income. The time, however, it is to be hoped, is not far distant, when it will be put on a better and more respectable footing.—When the superior importance of such inquiries, the superior value of agricultural resources, the dreadful expence, and fatal consequences occasioned by their deficiency, will be so clearly ascertained, as not to be a subject of doubt to the weakest understanding. For the purpose of effecting so desirable an object, I propose preparing, in the course of the ensuing recess, for the consideration of the Board, and if it should have the good fortune of meeting with their approbation, to be laid before his Majesty, and both Houses of Parliament, a General Report on the Agricultural State of Scotland, and the means of its improvement. That work will probably explain, in a satisfactory manner, the soundness of that political maxim, that the prosperity of a country ought to be founded, on a spirit of internal improvement, and that a single additional acre cultivated at home, is more truly valuable, than the most extensive possessions acquired abroad, at an enormous expence of treasure and of blood, and retained with difficulty and danger. To that important subject, when hostilities are brought to a conclusion, I trust that the attention of this country will be directed. Fortunately, by the

exertions of the Board of Agriculture, when peace is happily restored, the internal state of this kingdom will be sufficiently ascertained, and we shall be able to judge, what are the fittest steps to be taken, in order to make the utmost of our domestic resources. To that period I look up with much anxiety. If Europe once more breathes in peace, and is governed by wise counsellors, the contest among nations naturally will be, not who will feel the greatest eagerness to rush again into the horrors of war, under the pretence of promoting national glory, but who will be the most anxious to remain in peace, for securing the national interests.

I cannot conclude, without expressing my best acknowledgments, for the assistance I have received from so many respectable Members, in carrying on the business of this institution. By their exertions, I trust, it will be brought to such a state, that from its establishment will be dated, not only the improvement and internal prosperity of our own country, but much of the comforts enjoyed in future times by society in general. Permit me to add, that when the Board re-assembles, each of us will, I hope, bring some proof of his zeal for the cause, by the additional information we shall respectively furnish. He who augments the stores of useful knowledge already accumulated, whilst he secures to himself the most satisfactory sources of enjoyment, promotes at the same time, in the most effectual manner, the happiness of others.

APPENDIX. N.

General View of the Inquiries essential for the Internal Improvement of the Kingdom, with the Plan for reprinting the Agricultural Surveys, in a corrected form. By the President of the Board of Agriculture.

A BOARD established for the purpose of making every essential inquiry, into the Agricultural State, and the means of promoting the internal improvement of a powerful empire, will necessarily have it in view, to examine the sources of public prosperity, in regard to various important particulars. Perhaps the following is the most natural order for carrying on such important investigations; namely, to ascertain,

1. The riches to be obtained from the surface of the national territory.
2. The mineral or subterraneous treasures of which the country is possessed.*

* The following Letter on the subject of a Mineralogical Survey, written by the celebrated Kirwan, that respectable philosopher, is recommended to the reader's attention.

SIR,

When last I had the honour of meeting you in London, you were pleased to express a wish, that, in order to promote a mineralogical survey of the kingdom, the proper objects of inquiry in every country should be briefly pointed out, and in such a manner, as that they may easily be discerned even by such persons as cannot be supposed to be deeply versed in such matters; in compliance with your wishes I now send you the principal heads of such inquiries, many of which may be satisfactorily answered by architects, common land surveyors, masons, and even labourers, though it were to be wished that persons of still superior education, as those of the clerical and medical professions, were also con-

3. The wealth to be derived from its streams, rivers, canals, inland navigations, coasts, and fisheries: And

4. The means of promoting the improvement of the people in regard to their health, industry, and morals, founded on a *statistical* survey, or minute and careful inquiry into the

sulted. In the mining countries in particular, as Cornwall, Derbyshire, Flintshire, Devonshire, Lancashire, &c., the overseers of the works could give the best information: in many, several private gentlemen are known to be well instructed in those matters.

1st. Are there any mountains in that county? and their names; what is their course or direction? their height, known or reputed? whether of steep or gentle ascent, cultivated, woody, or otherwise? dry or abounding in springs? in continued ridges, or separate and distinct? what sort of stone are they formed of, (whether at the top, middle, or bottom? what is their inclination?) or is found in them? as granite, sandstone, whin, limestone, marble, alabaster, Derbyshire spar, freestone, flags, slates, gravel, flint, &c. are they solid or cavernous? are they single or one within the other? and the different stones in each. What other hills or *eminences* are there? of what composed? stony or chalky, and their direction and bearings with respect to the mountains?

2dly. What rivers traverse the county? their names, length, breadth, depth, and direction, what lesser streams flow into them, and their direction? temporary or perennial, apt to overflow or otherwise? what lakes and their extent?

3dly. What, or do any mineral springs occur in any or what parishes, and what is their nature if known? by whom examined and when?

4thly. What sort of stone commonly occurs in different parishes in the plains? in sandpits, making of roads, for building, millstones, &c. and what quarries?

5thly. What are the different soils that occur in different parishes, as clays, marls, sands, loams, are these last clayey, or sandy, or gravelly, or chalky? what mosses? do they yield peat? have brick clay, fire-clay, potters' clay, terras, fullers' earth, tripali, &c. been found?

6thly. What mines are found in the country? whether metallic, or saline, or coaly? whether in veins, or beds, or bellies? their inclination and direction or bearing? how is the ore raised? where are the ores worked, and the general mode of smelting them? were any, or what *improvements* lately made in the manner of draining them, freeing them from water, or working, or smelting them? are there any still required? have all the hills and mountains been yet examined, with regard to their mineral contents?

7thly. Have any collection or cabinet of the fossils of each county as yet been formed? let samples of each, docketed with the name of the place in which it was found, be sent.

Much information, relative to these inquiries, may be found in the Philosophical Transactions, histories of particular shires and counties, as Cornwall, Derbyshire, &c.; tours through England, Wales, and Scotland, the works of Woodward. A committee may perhaps be named, to examine these, and arrange the particulars found in each shire, which might perhaps help the persons, to whom queries are to be addressed, to recollect and find them.

These are the particulars which at present occur to me, they may be digested, enlarged, and perhaps better methodized in a committee. When answers are had, which at farthest may be in a year or two, a mineralogical map of the kingdom may be formed, serving as a fund of information, and a ground of future improvements in Agriculture, commerce, and all the arts.

I have the honour to be your very obedient and humble Servant,

Dublin, November 17th, 1795. R. KIRWAN.

To Sir John Sinclair, Bart. &c. &c.

actual state of every parochial district in the kingdom, and the circumstances of its inhabitants.

Under one or other of these heads, every point of real importance, that can tend to promote the general happiness of a great nation, seems to be included.

Investigations of so extensive and so complicated a nature, must require, it is evident, a considerable space of time before they can be completed. Differing indeed in many respects from each other, it is better perhaps that they should be undertaken at different periods, and separately considered. Under that impression, the Board of Agriculture has hitherto directed its attention to the first point only, namely the cultivation of the surface, and the resources to be derived from it.

That the facts, essential for such an investigation, might be collected with more celerity and advantage, a number of intelligent and respectable individuals were appointed, to furnish the Board with accounts of the state of Husbandry, and the means of improving the different districts of the kingdom. The returns they sent were printed, and circulated by every means the Board of Agriculture could devise, in the districts to which they respectively related; and in consequence of that circulation, a great mass of additional valuable information has been obtained. For the purpose of communicating that information to the public in general, the Board has resolved to publish the survey of each county, as soon as it is brought to a state fit for publication. When all these surveys shall have been thus reprinted, it will be attended with little difficulty to draw up an abstract of the whole (which will not probably exceed two or three volumes quarto) to be laid before his Majesty, and both Houses of Parliament; and afterwards, a General Report on the present state of the country, and the means of its improvement, may be systematically arranged, according to the various subjects connected with Agriculture. Thus every individual in the kingdom may have,

1. An account of the husbandry of his own particular county; or,
2. A general view of the agricultural state of the kingdom at large, according to the counties, or districts into which it is divided; or,
3. An arranged system of information on agricultural subjects, whether accumulated by the Board since its establishment, or previously known;

And thus information respecting the state of the kingdom, and Agricultural knowledge in general, will be attainable with every possible advantage.

In reprinting these Reports, it was judged necessary, that they should be drawn up according to one uniform model; and after fully considering the subject, the following form was pitched upon, as one that would include in it all the particulars which it was necessary to notice in an Agricultural Survey. As the other Reports will be reprinted in the same manner, the reader will thus be enabled to find out at once, where any point is treated of, to which he may wish to direct his attention.

PLAN OF THE REPRINTED REPORTS.

Preliminary Observations.

CHAP.

I. Geographical State and Circumstances.
- SECT. 1—Situation and Extent.
- 2—Divisions.
- 3—Climate.
- 4—Soil and Surface.
- 5—Minerals.
- 6—Water.

II. State of Property.
- SECT. 1—Estates and their Management.
- 2—Tenures.

III. Buildings.
- SECT. 1—Houses of Proprietors.
- 2—Farm Houses and Offices; and repairs.
- 3—Cottages.

IV. Mode of Occupation.
- SECT. 1—Size of Farms—Character of the Farmers.
- 2—Rent—in Money—in Kind—in Personal Services.
- 3—Tithes.
- 4—Poor Rates.
- 5—Leases.
- 6—Expence and Profit.

V. Implements.

VI. Inclosing—Fences—Gates.

VII. Arable Land.
- SECT. 1—Tillage.
- 2—Fallowing.
- 3—Rotation of Crops.
- 4—Crops commonly cultivated; their Seed, Culture, Produce, &c.*
- 5—Crops not commonly cultivated.

VIII. Grass.
- SECT. 1—Natural Meadows and Pastures.
- 2—Artificial Grasses.
- 3—Hay Harvest.
- 4—Feeding.

IX. Gardens and Orchards.

X. Woods and Plantations.

XI. Wastes.

* Where the quantity is considerable, the information respecting the crops commonly cultivated, may be arranged under the following heads.

1. Preparation { tillage, manure. }
2. Sort,
3. Steeping.
4. Seed (quantity sown)
5. Time of sowing.
6. Culture whilst growing { hoe, weeding feeding. }
7. Harvest.
8. Thrashing.
9. Produce.
10. Manufacture of bread.

In general the same heads will suit the following grains: Barley. Oats. Beans. Rye. Peas. Buckwheat.

Vetches - Application.

Cole-seed { Feeding, Seed. }

Turnips { Drawn - - - - / Fed - - - - - / Kept on grass - - / —— in houses - - }

CHAP.
XII. Improvements.
SECT. 1—Draining.
2—Paring and Burning.
3—Manuring.
4—Weeding.
5—Watering.
6—Embanking.
XIII. Live Stock.
SECT. 1—Cattle.
2—Sheep.
3—Horses, and their Use in Husbandry, compared to Oxen.
4—Hogs.
5—Rabbits.
6—Poultry.
7—Pigeons.
8—Bees.
XIV. Rural Economy.
SECT. 1—Labour — Servants — Labourers—Hours of Labour.
2—Provisions.
3—Fuel.
CHAP.
XV. Political Economy, as connected with or affecting Agriculture.
SECT. 1—Roads.
2—Canals.
3—Fairs.
4—Weekly Markets.
5—Commerce.
6—Manufactures.
7—Poor.
8—Population.
XVI. Obstacles to Improvement; including general Observations on Agricultural Legislation and Police.
XVII. Miscellaneous Observations.
SECT. 1—Agricultural Societies.
2—Weights and Measures.
Conclusion.—Means of Improvement, and the Measures calculated for that Purpose.

Appendix.

Perfection in such inquiries is not in the power of any body of men to obtain at once, whatever may be the extent of their views or the vigour of their exertions. If Lewis XIV. eager to have his kingdom known, and possessed of boundless power to effect it, failed so much in the attempt, that of all the provinces in his kingdom, only one was so described as to secure the approbation of posterity;* it will not be thought strange that a Board, possessed of means

* See Voltaire's Age of Lewis XIV. vol. ii. p. 127, 128, edit. 1752.
The following extract from that work will explain the circumstance above alluded to.
" Lewis had no Colbert, nor Louvois, when about the year 1698, for the instruction of the Duke of Burgundy, he ordered each of the intendants to draw up a particular description of his province. By this means an exact account of the kingdom might have been obtained, and a just enumeration of the inhabitants. It was an useful work, though all the intendants had not the capacity and attention of Monsieur de Lamoignon de Baville. Had what the king directed been as well executed in regard to every province, as it was by this magistrate in the account of Languedoc, the collection would have been one of the most valuable monuments of the age. Some of them are well done; but the plan was irregular and imperfect, because all the intendants were not restrained to one and the same. It were to be wished, that each of them had given, in columns, the number of inhabitants in each election; the nobles, the citizens, the labourers, the artisans, the mechanics, the cattle of every kind; the good, the indifferent, and the bad lands; all the clergy, regular and secular, their revenues, those of the towns, and those of the communities.
" All these heads, in most of their accounts, are confused and imperfect; and it is frequently neces-

so extremely limited, should find it difficult to reach even that degree of perfection which, perhaps, might have been attainable with more extensive powers. The candid reader cannot expect in these Reports more than a certain portion of useful information, so arranged as to render them a basis for further and more detailed inquiries.* The attention of the intelligent cultivators of the kingdom, however, will doubtless be excited, and the minds of men in general gradually brought to consider favourably of an undertaking, which will enable all to contribute

sary to search with great care and pains to find what is wanted. The design was excellent, and would have been of the greatest use, had it been executed with judgment and uniformity."

* The County Reports, as originally drawn up, were circulated merely as a foundation for procuring additional information; and indeed, when corrected, they ought to be considered only as chapters of a great work, and not as distinct publications. Even in their original state, however, they are extremely valuable; and Dr. James Anderson, who, in consequence of his being employed by the Board, had an opportunity of perusing them, thus states his opinion of the mass of information which they contain. "The Board of Agriculture," he observes, "is an institution, which if its inquiries shall be prosecuted for a sufficient length of time, with due caution and energy, will be productive of national benefits, greater than perhaps have been derived from any other political institution, in modern times. For although the money, which has been expended on this department, when compared with that bestowed on any other national establishment, may be considered as nothing, yet, in consequence of its exertions, continued for the course of little more than one year, a body of authentic facts, respecting the agricultural and internal economy of this country, have already been laid before the public, greater than was ever obtained in any other nation since the beginning of time; on which facts the political inquirer can ground his reasonings, on many of the most important topics, that can ever engage his attention, with a degree of certainty he could *never* have otherwise obtained. In consequence of this, many ideal phantoms of proposed national aggrandizement will be banished, and, in their stead, plans of substantial improvement will be brought forward, which could not otherwise have been adopted; because the obstructions, which repress alike the suggestions of genius, and the hand of industry, would have remained unknown, as they hitherto have been, in every European nation, and of course entirely unattended to by those classes of men, who alone have power to remove them.

"As a striking illustration of the truth of these assertions, (he goes on to remark) that the essay he submits to public consideration, (on the obstacles to the advancement of Agriculture in England) will consist of little more than a compressed view of the facts that have been brought to light by the Agricultural Surveys *already printed*, some of which were facts unknown, or never adverted to, by every person who should read his publication: for I presume, (he observes) that no one person in any situation in Britain, could have otherwise had an opportunity of observing the whole; and innumerable persons no doubt exist, who are deeply interested in the discussion, who never before had adverted to one of them: and who of course could never be aware of the very important consequences that flow from them."

The Doctor then proceeds to state the principal obstructions to Agriculture, which occurred to him in the course of a careful perusal of those Reports, in which the reader will find much useful information.† If such a paper could be drawn up, with the assistance of the original sketches of those Reports alone, what light may not be expected, when they are reprinted in a corrected form, with all the additional materials, which have been collected, in the course of their circulation.

† See Essays relative to Agriculture and Rural Affairs, Vol. 3. p. 4.

to the national stores of knowledge, upon topics so truly interesting as those which concern the Agricultural interests of their country; interests, which on just principles never can be improved, until the present state of the kingdom is fully known, and the means of its future improvement ascertained with minuteness and accuracy.

The necessary inquiries into the riches of the surface, will soon be completed; and if the other inquiries above hinted at, are gone into with equal energy and spirit, this kingdom may reach a degree of political strength, and its inhabitants will enjoy a height of public and of individual happiness, which it is believed has never hitherto been attained in any other country.

APPENDIX. O.

Plan of an Agreement, among the Powers of Europe, and the United States of America, for the Purpose of rewarding Discoveries of general Benefit to Society. By the President of the Board of Agriculture.

THE plan of establishing a Board of Agriculture, for promoting the internal improvement of Great Britain, though long a favourite idea of the person who brought forward that proposal, yet could never have been carried to its present state of perfection, had it not been for an extensive tour which the Author made, through some of the most interesting parts of of Europe. In the course of that tour, he saw several valuable institutions for public purposes, from each of which, as well as from those at home, he took such hints as seemed to him likely to be of service, and formed on the whole the plan of an establishment, on a scale sufficiently extensive, to merit, he flattered himself, the approbation of a British Senate: and Parliament was at last prevailed upon to adopt it, not, however without some opposition, and merely as an experiment. The result, he flatters himself, must be in the highest degree satisfactory to those who wished well to such an undertaking. The Board was constituted only on the 4th September, 1793, and already a greater mass of Agricultural and Statistical knowledge has been collected, in little more than a year and a half, than ever was accumulated before in so short a period.

The improvement of his native country, was not the sole object, which the Author, however anxious to promote it, had in view, when he formed this establishment. He knew well that it would soon prove of general benefit to society. The carrying on, therefore, a correspondence with foreign states, disposed to enter into such an intercourse, was a part of the original plan. A Secretary, acquainted with several of the most important languages in Europe, was attached to the Board, for the purpose of conducting that correspondence; and though the war, so generally raging on the Continent, has given a different direction to the minds of men, and greatly impeded such an intercourse, yet much useful information has been received from, and communicated to, foreign countries, since the Board was established.

There are some points connected with the improvement of a country, which are only applicable to particular places; an improvement, for instance, in the culture of the vine would be of no use to the northern parts of Europe; nor would it be of any consequence in the southern,

that the Scotch fir could be made doubly valuable, by using the branches of young fir, as an article of food for sheep or cattle, in the winter season, when it is so difficult to support them. There are many objects, however, of equal importance to all countries, and in the improvement of which every nation is equally interested; for example, any discoveries in consequence of which a greater quantity of animal or vegetable food can be produced for the use of man,—any improvement in medicine,—in the means of saving fuel,—in the construction of houses for the lower orders of the people, &c. and many other particulars of a similar nature.

Discoveries made in one country, gradually reach another: but the interval is often tedious, and the loss thereby sustained is great; whereas if the progress could be more accelerated, the consequences might be in the highest degree beneficial, not only to the country that receives, but to the one that makes the discovery. For no individual, or even nation, can carry any art or new invention to its ultimate state of perfection. It must be improved upon for that purpose by the investigation and experience of others.

Deeply impressed with the justness and importance of these ideas, I take the liberty of submitting to the consideration of those intrusted with the government of this, and of other states, the propriety of a general Agreement among the Powers of Europe, and the United States of America, for the purpose of rewarding those who make any useful discovery, interesting to the species at large, in Rural Economy, in Medicine, or in the Useful Arts, and that every means be taken to have the same rapidly extended, and brought to its ultimate state of perfection.

Such an agreement would be attended with but little expence to the different powers who entered into it, whilst the credit, the satisfaction, and the benefit which each government would ultimately derive from such an understanding would be of infinite value.

If each power should agree to pay a sum, call it from £ 50. to £ 500: or £ 1000. according to the amount of its revenue, and to the advantage it would be likely to obtain from any new invention of the nature above alluded to, it would be of little consequence to each, whilst the total would be of considerable value to the fortunate discoverer.

The attention of mankind being directed to such useful objects, it is impossible to say to what perfection the arts necessary for their comfort and sustenance might be carried.

The desire for fame and emolument, and the emulation of many nations, rivalling each other in such arts, would soon produce discoveries, the importance of which can hardly be estimated at present.

And such an understanding, though it would not probably put a stop to war, yet might have the effect of rendering wars less frequent, and less ferocious.

I was led to bring forward such reflexions, sooner than otherwise I had intended, in consequence of having lately succeeded in obtaining from Parliament, the grant of £ 1000. to Mr Joseph Elkington, so celebrated for his skill in Draining, and knowledge of springs.

The art which he has acquired in such perfection, would be as useful to other countries, as it is to Great Britain, and no reason can be assigned, why it should not be immediately extended all over Europe and America.

Here there can be no rivalship; for the Agricultural prosperity of one country can do no injury to another; and indeed it may be of considerable service, in times of scarcity for instance, from which the most fertile cannot always be exempted.

Let us suppose, therefore, that such Powers as chose to enter into the Agreement above suggested, in addition to the £1000. already voted by the British Parliament, were to begin the proposed agreement, by subscribing each a sum of money to Mr. Elkington, on his disclosing his discoveries in so clear a manner, that other nations might avail themselves of the same valuable art.

Can any discovery be of more general utility? In a moist country, it is well known, that nothing is so much to be wished for as to get rid of water. In a country that is dry and parched, what can be more desirable than to obtain the command of springs?—In both these respects, there is every reason to believe, that Mr. Elkington has reached a very high, and hitherto unequalled, pitch of excellence.

If examples of the benefit to be derived from such an agreement, in regard to other matters, independent of Agriculture, is wanting, it may be sufficient to remark, that an American physician is said to have found out a valuable remedy for the cancer, and a German, a very effectual palliative, if not a cure, for the stone and gravel. As these are acknowledged to be perhaps the most dreadful disorders to which the human frame is subject, surely such discoveries are objects of general concern, and if brought to perfection, ought to be rewarded by every civilized power in the universe.

The only objection to such a measure, is, the risk of imposition on those Powers, who live remote from the place where such discoveries may be made. But surely those who trust their respective Ministers with the management of great political concerns, may safely confide to them the disposal of any sum that may be necessary for such a purpose. Besides, it would be desirable to have a Board of Agriculture and Internal Improvement established in every country, for the purpose of carrying on a correspondence and intercourse between the different States of Europe and America, on subjects of general moment, and to the examination of such a body, any discovery of a doubtful nature might be referred.

If the measures above hinted at were adopted, a new scene in politics might be the happy consequence, and the rulers of nations might in future boast,—not of their numerous fleets,—not of their gallant armies,—not of extended commerce,—of splendid or luxurious arts, or acquisitions by intrigue or conquest,—BUT OF THIS,—*That within their respective dominions, a greater number of human beings, enjoyed all the blessings of political society, in greater perfection, than hitherto, they had ever been enabled to attain, in any former period of history.*

London,
1st July, 1795.

CONCLUSION.

THE preceding papers, will sufficiently explain, the various measures, which have been recommended to the attention of the Board of Agriculture, for the purpose of promoting the internal improvement and prosperity of the country. It may not be improper, however, here to recapitulate them, in order that the reader may have, under his eye at once, a general view of the whole system.

1. The first object, is the one which the Board has already sanctioned, namely, that of inquiring into the riches to be obtained from the surface of the national territory. With that view, it is proposed, to lay before the public, as expeditiously as possible, corrected Reports of the Husbandry of each particular county, and the means of its improvement; and some steps also are taking, towards preparing an arranged system of information, on Agricultural subjects. The farmer will thus be furnished, with all the knowledge he could possibly wish for, regarding either his own particular district, or the art of husbandry in general, and the landlord will have easy access, to any information he can require, for managing or improving his property, in a manner infinitely more to his own benefit, and to the public advantage, than it is possible for him, at present, to imagine.

2. The mineral or subterraneous treasures of which a country is possessed, is the next great object of inquiry, and a most important one it is, for in many cases the riches of the surface, in point of real value, is nothing compared to what may be found under it. A complete and regular survey of our subterraneous wealth, would be the means of furnishing greater sources of opulence to this country, than the acquisition of the mines of Mexico and Peru. In fact, Great Britain, at present owes, no inconsiderable portion, even of its agricultural and commercial

wealth, to its fossil and mineral treasures; and the great additions which would necessarily arise in consequence of the proposed survey, would be felt, throughout every productive artery of our national prosperity.

3. Another separate head of inquiry, and source of incredible wealth, is, the riches to be derived from the streams, rivers, canals,* and inland na-

* I think it necessary here, to give the reader some faint idea, of the astonishing advantages to be derived, merely from applying the *waste water* of canals to the purposes of irrigation. The following is a circular letter written at the desire of the Board upon that subject, and the observations thereon by a very intelligent engineer.

I. Circular Letter to the Canal Companies.

GENTLEMEN, *Board of Agriculture, July, 1796.*

"I am requested by the Board of Agriculture, to submit to your consideration, a subject of considerable national importance, that of applying navigable canals to the purpose of irrigation, or of watering land. We have every reason to believe, that the canals already formed, or now forming, might be made applicable to this very material use, without any injury to their common destination; for though it might not be proper in many cases to spare water in summer, yet in winter and spring, when most abundant and least essential to navigation, its utility, if thrown on the adjacent lands, would be indisputable; and by this means a considerable revenue might accrue to the owners of canals, by granting certain quantities of water weekly, or monthly, to the proprietors of the adjacent ground, and infinitely to the advantage of the public. Should this idea meet with your approbation, the Board would apply for a general act of Parliament, to permit the proprietors of canals to make this use of their waste water, and for any other general regulations respecting canals, which may be thought necessary, and which you may have the goodness to suggest. The act might pass so early, that it might be in your power, in the course of the ensuing winter, to try experiments on the practicability of the measure. Engineers, skilled both in navigation and in irrigation, would soon ascertain what quantity of water could be spared from each canal, at the different seasons of the year, and the extent of land over which it might be conveyed. It may not be improper to inform you, that this use of navigable canals, has long been common, and carried to a considerable extent in the Milanese, where the rents paid for water thus taken, have in some cases equalled the expence of forming the navigation; that this plan, has rendered that part of Italy, among the most fertile and opulent in Europe, and contributed more to the improvement of the country, than any other idea that has been adopted. It is from water-meadows thus obtained, that the celebrated Parmesan cheese, is, in many instances, produced.

"The anxiety felt by the Board of Agriculture for extending the benefits resulting from your useful undertakings to new objects, which might prove equally beneficial to yourselves and to the public, has occasioned this trouble on the part of Gentlemen, &c.

"P. S. I think it proper to add, that there are some useful works, in the German, Dutch, and Swedish languages, on canals, embankments, and the like, which it would be worth while

vigations, coasts, and fisheries of the kingdom. That many additional millions, per annum, might be obtained by a proper attention to those unbounded sources of national riches, can hardly be questioned. By extending inland navigation, by improving the harbours on our coasts,

for the Canal Companies in England to join in having translated. If each Company would subscribe for from 10 to 50 copies, such translations might be obtained and printed."

II. *Extract of a Letter from an intelligent Engineer, on the above Subject.*

"I have received your circular letter respecting the plan of watering of land by the means of navigable canals; on which there ought only to be one opinion as to its being a point of the greatest importance, which could have come under the consideration or patronage of the Board of Agriculture; and if any obstacles should occur, they must arise from prejudices which time will wear off; for that such a rational application of the waste water of canals, will at one period or another take place, seems not to admit of a doubt.

"In Europe, the improvements in the Milanese, are a striking instance of the fertility which may be created by such an application of the waste water of canals; and if any thing else was wanting to add to this conviction, the economy of the waters of the Nile may be produced as another instance, and perhaps even a more striking one than the Milanese; as in this last case, an unrivalled fertility was spread over the sandy wastes of Egypt and the Thebais, and even over the scorching plains of Lybia.

"The lake Mœris, formed as a reservoir in the bosom of barren mountains, is a feature which cannot be mistaken; and it ought to prove an useful lesson for the management of rivers in general, most of which, in some place or other, may be treated in the same way: the excess of floods may be drawn off, and in dry seasons water may be issued for the use of the navigation of the same rivers, for the working of mills, for the purposes of watering land, and for supplying navigable canals.

"The very lakes which now exist in Great Britain, may in general, and at a very moderate expence, be raised a few feet above, or drawn off a few feet below, their usual level, and this upon extensive surfaces, would supply a quantity of water which would produce much fertility to the countries which lie below that level.

"A general survey of the kingdom, directed so as to ascertain the comparative levels of its surface, would be a very necessary step towards the general management of water; and this survey should be made with great accuracy, and noting the leading objects, and peculiar advantages and disadvantages in each district, with their relative situations as to the connecting districts; and from these separate Reports and Surveys, a general arrangement of the whole might take place, and many useful plans be pointed out.

"In general, I should suspect that in this business, there are evils to be guarded against, and which are likely to arise from two very opposite classes of people. In the one class may perhaps be ranged, those land-owners and mill-owners, whose minds are not so sufficiently enlightened as to be sensible of the general utility of the scheme, or the benefits which must eventually

and by carrying our fisheries to the height of which they are capable, it is impossible to say, what additional treasures might not be accumulated. That, however, must entirely depend, on our making the necessary inquiries, and following up a regular system of improvement.

4. But riches alone, are not sufficient, to make either an individual or

arise to themselves; and they, of course, will be averse to submitting to any alterations which may interfere with the water.

" And the other class will consist of projectors and projecting engineers, who may be in any shape engaged in the arranging or executing this plan, and who being wholly engrossed with new schemes, may be led to despise real obstacles, and to give a favourable complexion to impracticable projects.

" As the first, it is hoped, will not form a majority of the community, an act of parliament will remove all legal obstructions as far as it respects them; and a perseverance in repeating calm demonstrations, and the sensible operation of the scheme itself, must in the end, convince them that so far from this plan proving an injury or injustice, that not only the country at large demands it, but that they will be benefited individually; indeed there is no reason but their own obstinacy, why they should not be benefited immediately, and that in a double capacity; because as canal stock is transferable, and fluctuating, these land-owners, and mill-owners may become proprietors of the canal navigations, and so receive a share of the advantages arising from this distribution of water, and they may likewise, in this way, have a voice in the direction of its operations.

" And besides this, canal stock seems more than any other property, to connect the apparent interests of the greatest number of individuals, with the improvement of the land and manufactures of the countries through which the canals pass, since it is in proportion to this prosperity that the canal proprietors can receive their pecuniary advantages from an increased tonnage: thus a number of persons residing in distant quarters of the kingdom, who probably could never have become land-owners, are in this way intimately connected with the improvement of the land, &c. This is a circumstance that I take the liberty of mentioning more at length, because I do not recollect that it has hitherto been taken notice of; and it appears to me of considerable importance. I have for instance, observed, that in a certain inland canal navigation, where there are upwards of 1200 proprietors, most of them people in tolerable circumstances, and in trade, and residing in 12 counties; that all of them are looking with anxiety to the increasing produce and consumption of Cheshire, Derbyshire, Montgomeryshire, and Shropshire, although, if it had not been for this circumstance, very few of them would have known or have concerned themselves about that part of the country.

" With regard to the being led astray by projectors or projecting engineers, this may be in a great measure prevented by the choice in the appointment of the engineers who are to take the surveys, and the committee under which they shall act, and the care to be taken in the comparing and arranging the several Reports and Surveys, and many of the Members of the Board of Agriculture will, from their own local knowledge, be enabled to check any false representation."

a nation happy, and for carrying national felicity to the extent of which it is capable, it is necessary to inquire into the circumstances of the people, and the means of promoting their improvement, in regard to their health, their industry, and their morals.

Hence arises the benefit to be derived, from those statistical inquiries, now nearly brought to a conclusion, so far as regards Scotland, and which, I trust, will soon be extended over the southern part of the kingdom. The advantages resulting from such investigations, need not here be dwelt upon, having already been sufficiently explained.

Lastly, though, when these inquiries are completed, the government will become possessed of all the information this country can furnish, for establishing the happiness of its inhabitants, yet to perfect the whole, it would be desirable, to unite all the civilized nations of Europe, and of America, in rewarding those, who make discoveries of real benefit to society. No single country, can expect to bring all the useful arts to perfection. Some improvements, it may always expect to receive, from other states; and if ingenious men have reason to believe, that any important discovery they make, would be rewarded by other nations, as well as their own, it is difficult to say, to what perfection and extent, the useful arts might speedily be carried. It was the emulation excited among the various states of Greece, that raised the liberal arts so rapidly to a height, in the age of Pericles, which it can hardly be contended, they have ever since reached, in any succeeding era.

I have thus sketched out a system, which, were it carried into effect, would surpass any thing hitherto suggested, not only for making this country happy and powerful, but also for accumulating that information, on the knowledge of which the general happiness of the species must depend. It is impossible for a private and unconnected individual, to do more than to point out the plan, and to declare his readiness to devote his time, and unceasing exertions, to assist in the execution of it. Should it now be arrested in its progress, he has the consolation of thinking, that

it will be no fault of his. At any rate, he has taken every measure in his power, to explain the nature and principles of the system, and to make it as generally known as possible, in the hopes, that either under the auspices of the present most valuable Institution, or of some other that may arise, in some future era, or perhaps in some other hemisphere, the plan he has sketched out, that extensive and laborious, but at the same time most important of all sublunary undertakings, may be happily accomplished.

COMMUNICATIONS

TO THE

BOARD OF AGRICULTURE.

PART I.

FARM BUILDINGS.

I. *On Farm Buildings in general.* *By* Robert Beatson, *Esq.*

SECTION I.

THE construction and arrangement, together with the situation of farm buildings, are objects of so much importance to the practical farmer, that they merit the most particular attention. On a judicious combination of these, the facility of carrying on his various operations, in a great measure, depends. Yet how few are the examples we meet with of farm offices either commodiously planned, or judiciously situated.

Whether we view this subject as relating to the landlord, to the tenant, or indeed to the public at large, it appears highly interesting.

To the landlord it is a matter of considerable moment, a part of his rents very often depending upon it; for it is natural to suppose that a tenant, especially on a long lease, would give more for a farm if the house and offices were commodious, than if they are so miserably deficient, as most farm offices are. He would even be the more readily induced to take a farm on that very account, and thus the landlord may often lose a good tenant, merely by not having proper accommodation for him.

I have heard farmers declare, that they would willingly agree to pay 5 per cent. or more, on the expences laid out on commodious buildings, over and above the rent of the farm, rather than occupy for nothing those they at present possess; and that they would besides undertake to be at the expence of every ordinary repair during the continuance of their lease. How then can a landlord lay out a few hundred pounds to better purpose than to accommodate his tenants, if he gets not only 5 per cent. on the money thus laid out, but (provided his buildings are very complete) perhaps as much additional rent as will amount to 5 per cent. more.

I am well convinced that the great expence of erecting new farm buildings in the usual way, is a very material obstacle to altering the present form, for there are few landlords who would choose to lay out five or six times the rent of a

farm in new accommodations for that farm, if by propping and patching he can, at a small expence, make the old buildings answer.

When we hear of £ 500. being expended in building a barn on a small farm of about £ 100. rent, as is the case in some parts of England, and a thousand pounds laid out on a farm house, it is no wonder that landlords are cautious of engaging in such buildings; and it cannot be supposed that tenants would be mad enough to do so. Hence, perhaps, is the principal reason why the generality of farm houses and offices are in so ruinous a condition. But when farmers can be persuaded that such enormous barns are unnecessary, that their corn can be kept much more secure, and less liable to injury, in a well-aired rick-yard; and that if they have just room enough in their buildings for all the common purposes of the farm, no more is requisite: also, that a neat, small, commodious dwelling house, is fully more comfortable than a large dismal one; then we shall find that landlords will more readily agree to accommodate their tenants, and that instead of those gloomy, preposterous, ruinous, buildings, now a disgrace to almost every part of the kingdom, we shall behold neatness and uniformity, combined with every necessary accommodation; which will afford not only pleasure and comfort to the occupiers, but a beauty and an ornament to the country at large.

That this may be accomplished at a very moderate expence, I hope to be able to prove in the sequel.

So far as any general rule can be given upon this subject, and allowing for circumstances and the variation of prices, I am fully persuaded by the observations I have made in different parts of the kingdom, that in general one year's rent of the farm, if not under £ 70. (or at most two) is amply sufficient for building every accommodation necessary upon that farm, exclusive of the dwelling house: and that one year's rent is enough to build a dwelling house, on all farms not exceeding £ 400. a year (in many situations less may do). And lastly, that £ 500. are sufficient for a dwelling house, and £ 1000. for offices on a farm of any extent.*

To a tenant, the construction and arrangement of his farm buildings, is a matter perhaps of more importance than even to a landlord. After all his toils and labours,

* In building new farm houses and offices, a great saving of expence will accrue by making use of all the serviceable materials in the old buildings, where such buildings are; and it will astonish many (provided they are fairly dealt with) who have been accustomed to those large, unnecessary, and expensive, buildings commonly used, at how small an expence, comparatively speaking, a new set of

and the many anxious and sleepless hours he has passed before his crop has come to maturity, if his offices are insufficient or improperly constructed, he still runs the risk of many inconveniences, and even real loss. The security of his grain, the labour and the value of his horses and other cattle, the safety and duration of his implements, are all dependent on the perfection or imperfection of his offices.

By arranging them judiciously (a matter very little attended to) a great deal more labour may be obtained from his servants, and every operation on the farm will be carried on with more facility and dispatch. For if a barn is set down here, a stable there, a cow-house or feeding house in another place, all without rule or order, and as if chance had set them down, much unnecessary labour will be occasioned, and a great deal of time lost in carrying provender to the cattle, and in keeping them so clean and dry as is necessary towards their health and preservation.

Farm buildings should be proportioned and constructed according to the size and produce of the farm; which, in settling their dimensions and arrangement, must be particularly taken into consideration. If, for example, the farm is adapted entirely to grazing, very few buildings will be necessary, except some sheds, and these will be in use chiefly during the winter season, temporary ones being often erected in the fields for the summer. On farms where cattle are housed only in winter, or in such farms where more buildings are used in winter than in summer, a great expence in roofing may be saved in cattle sheds, by erecting walls only, or having pillars or posts placed and framed in such a manner as to support hay-ricks, peas, or any other sort of ricks that are not intended to be taken down till the spring or summer. This will not only answer the purpose of an excellent warm roof, but will be a very good situation for building such ricks. If, however, the farm is entirely for grazing, as before supposed, there may not be a sufficiency of ricks, unless of the fodder for the cattle, to make such temporary roofs. In that case the sheds must of course have permanent ones, which may be of the cheapest construction. Or if there should be a sufficient number of boards about the farm, as is sometimes the case, they may be laid loosely on, to serve as a roof to the sheds, till wanted for other purposes.

A dairy farm will require a different sort of accommodations, being in general

offices, or house may be built, having the advantages of such materials near the spot. Workmen, in general, are much averse to using old materials, especially carpenters, who, rather than run the risk of touching a rusty nail, with a hatchet or a saw, will put their employer to the expence of some hundreds of such tools, by condemning the old, and advising him to purchase new timber.

composed partly of the grazing and partly of the arable kind. The cow-houses must be proportioned to the number of cows usually kept, with every other accommodation for carrying on the dairy business, whether as a cheese or butter farm. Small stables and a small barn are sufficient for such a farm. But in an arable or corn farm, which generally partakes of both the other sorts, the buildings must be more numerous, and suited in some respect to all these different purposes. The stables, in proportion to the number of horses or cattle requisite for labouring the farm. The cow-houses and feeding-houses, according to the number of cows generally kept, and cattle fed. The barn and granary, according to the extent of arable land; together with all the other usual accommodations for breeding young horses or cattle, for hogs, poultry, &c. all which must be particularly considered of while planning the farm offices.

Since the invention of thrashing mills, a most material alteration may be made in the construction of farm buildings, particularly in barns. The tedious and laborious operation of thrashing with the flail, made it necessary to have the barn large enough to hold a great quantity of corn in the straw, or at least to contain a whole stack at once; and besides, to have it so lofty as to give sufficient height for raising the flail. This is by no means necessary where there is a thrashing mill; for as the mill, if properly constructed, will thrash the corn as fast as taken in, it is unnecessary to throw in the whole stack at once; and what remains of it in the rick-yard, if any, may be covered with a tarpawling, or painted canvas for that purpose; a thing that every farmer ought to have, being of essential use either in case of a sudden shower in harvest when building a stack or hay-rick, or of leaving one unfinished at night, or any other time.

A thrashing mill not requiring so lofty a barn as a flail, a very convenient granary or store-room may be obtained above the mill, which, in the common way, could not have been had. In short the advantages of a thrashing mill are so numerous, that no farm producing 1000 or 1200 bushels of grain annually, should be without one; but as this very useful machine will be fully described when treating of Implements, the reader is referred to that article for a particular description of it.*

When the plans of any farm buildings are finally determined on, there are many preliminary considerations necessary to be attended to, previous to the commencement of the work. The situation with respect to the quality of the air, the water, materials

* See General Report, chapter on Implements: also Practical Treatise on Rural Improvements.

for building, access and exposure, the soil for laying the foundations upon, the best method of conducting the drains, together with the expence of completing the whole. But as it would far exceed the bounds intended for these general observations, to enter into a detail of these subjects, and as they will all be fully and minutely explained in the Practical Treatise on Rural Improvements (a work now preparing for publication), as also the manner of carrying on the building, laying the ground floors, covering the roofs in various ways, &c. We shall therefore refer to that work for these particulars, and proceed to submit the following remarks on farm houses. Afterwards on farm offices separately, and then on arranging them together in the most commodious manner.

SECTION II.

Farm Houses.

A FARM HOUSE ought not only to contain every conveniency for a family, but should have a degree of neatness and uniformity, which, if properly managed, will cost no more than a dull irregular building. Columella says, that "a farm house should be somewhat elegant, to give pleasure to its possessors, and to allure the wife to take delight in it. It should be built on the most healthy spot of the farm, in a temperate air, such as the middle of a hill commonly enjoys, where it is neither stifling in the summer, nor exposed to the rage of winds and storms in the winter."

The size of a farm house should be regulated by the size of the farm, although not so strictly so as the other buildings; a parlour and kitchen, with dairy, closets, and other conveniences, below stairs, and the upper story divided into bedchambers, are sufficient accommodation for any farmer's family. These may be contracted or enlarged according to circumstances, or to the inclination of the proprietor: but it is better to give a little more room than necessary, than not to give enough.

None of the buildings about a farm admit a greater latitude of construction than the farm house; for sometimes a very small house may do for a very large farm; at other times it would require a pretty large house on a small farm, according to the size of the farmer's family, and, perhaps, to the situation in life he has been accustomed to; for there are many very respectable and worthy farmers, whose manners

and conversation entitle them to the best accommodation; and it sometimes happens that a landlord will consider this, and build a house for the farmer, instead of the farm.

There is something so pleasing in the appearance of neatness and cleanliness about a dwelling house, that even a stranger transiently passing by, cannot help being prepossessed with a favourable opinion of those within. He passes along with the idea fixed in his mind of prosperity and happiness presiding within those walls. How different the sensation felt on viewing a contrary scene:—a house dismal and dirty, the doors and walls surrounded and bespattered with filth of all denominations, and fragments of broken dishes and dirty dairy utensils scattered in all directions: a scene which must impress on the mind the idea of misery and mismanagement, and a contempt for those slatterns who can suffer such beastliness; for in such cases it is generally the female part of the family who have the merit or demerit of domestic appearances. And how easy a matter it is to constitute the difference: a little care and attention is the whole secret.

It adds greatly to the beauty and neatness of a dwelling house, to have a little plot of garden ground or shrubbery before it: this not only contributes to keep every thing neat and clean in front, but is often easier managed than a garden behind. After feeling the pleasure and satisfaction of keeping this plot in good order, every weed that appears visible from the windows, will be considered as a nuisance, and pulled up accordingly. So great an antipathy to weeds may thus be raised in the farmer's breast, that his efforts for their destruction may even be extended to the fields; and by these simple means a slovenly farmer may be so completely reformed, as not to suffer a weed to be seen on his farm.

Large windows add greatly to the cheerfulness of a farm house. The sashes being placed as near the outside of the wall as possible. The reverse of this is a glaring deformity in most houses in the northern parts of the kingdom. There the windows are so small, and the sashes placed so deep in the walls, that it gives the most disagreeable gloominess to the whole building. This is said to be done with an idea of preserving the sashes from the weather—a most egregious mistake. The sashes are perhaps more liable to injury by being deep in the walls, than by being placed near the outside, for they receive full as much wet, and are not so soon dried.

It is a common practice, and with many a general rule, to build the farm house adjoining to the offices. Where the situation will not admit of a better arrangement, or in a small farm, to save a few roods of building, this may be done; but in general it is

better to build the dwelling house, and any other buildings with chimneys in them, a little way detached from the farm offices, not only on account of the danger arising from fire, but of the disagreeableness (perhaps unwholesomeness), of living in a dung-hill, or in the midst of cattle and swine.

If a farm house, for the sake of uniformity, is to be built adjoining the farm yard, there should be a considerable length of wall at each end of it, to unite it to the offices. But it is certainly better to make the house a little distance from the wall of the yard, and whether that distance is ten feet or fifty feet, there can be little or no difference with respect to convenience. At the same time it is by no means advisable that the farm house should much exceed fifty or sixty yards from the offices, as there might unquestionably some inconvenience arise if beyond that distance.

In the annexed plans of farm houses, four things are particularly attended to in their construction:—simplicity, uniformity, convenience, and cheapness. In delineating such buildings, therefore, there is not that latitude given for a display of those architectural ornaments, which, in a higher sphere of buildings, are so pleasing to the eye, and so truly beautiful when disposed by the hand of a skilful architect. Such ornaments are unnecessary in farm buildings, and are therefore, in the following sketches, entirely omitted. At the same time a strict attention to uniformity is particularly observed; and although the windows are in general made something wider in proportion to their height, than is permitted by the rules of architecture, in order to answer the purpose of giving as much light as possible (the chief use of windows), it is however hoped, that no very great or offensive deviations are made from those rules, even in that case.

The accommodations are calculated to be as convenient as possible, in the family way; and by making the ground-floors at least 16 inches, or two steps, above the level of the ground, and taking proper care to lay those floors,* a great deal of that dampness (and consequently unwholesomeness) so often complained of will be prevented.

Many people prefer gable ends, as in Plate III. For my own part, I am of opinion that hip-roofs, and the vents within the building, are greatly preferable. The hip-roof requires no more materials; and the gable ends not only occasion more expence of building, but an unnecessary addition of weight upon the end walls. Vents built withinside the house are less liable to smoke than when in an outside wall; besides,

* Vide Pract. Treat. on Rur. Imp.

they contribute greatly to keep the house warm, for they act as flues, and diffuse their heat, in some degree, all over the building.

It will be observed that the principal walls are all delineated of the thickness of two feet: that being considered as the best thickness for rough stone walls. Where the stones are good, and of a proper form for building, or where bricks are used, the walls may, no doubt, be thinner: but when too thin, the heat of the sun in summer, and the coldness of the external air in winter, have so disagreeable an effect, by penetrating through, that it is best to err on the safe side, and to make them of a good thickness. This is one of the greatest inconveniences of brick buildings, for in general brick walls are so thin, that these effects are most sensibly felt both in summer and winter.

By making the different apartments and other divisions and conveniences no larger than necessary, the least possible expence will be incurred. The dimensions of these should be proportioned according to the sum intended to be laid out.*

In some parts of the country a house built on the plan, and of the dimensions shown in Plate I. may be completed for about 70 or 80 pounds. In other parts it may cost £150. or more; consequently it would tend only to mislead, by stating either the one or the other as an estimate of such a building. Yet to commence a building, without knowing previously the expence it will cost, should at all events be avoided,

* Very frequently a good plan is thrown aside, merely on account of the expence of putting it in execution; whereas it should be considered, that by contracting the rooms, and the building in general, the same plan might be executed accordingly, at whatever expence may be determined on. The following plans may therefore be varied in size, till of such dimensions as will cost no more than the sum allotted for that purpose. For these reasons, estimates of buildings, in a general view, are really of less importance than most people imagine; there being hardly two counties in the kingdom where the same plan can be executed at the same expence. Even in the same county and in the same parish, the expence will often vary considerably, according to circumstances. The distance from materials, the quality and price of those materials, the goodness or badness of the roads, the nature of the soil to be built on, and consequently the expence of the foundations, the price of labour, the season of the year, and even the state of the weather, all tend to make a difference in the expence of building. It is therefore hardly possible to make a correct estimate, unless the spot intended for erecting the building is known and examined; and an incorrect estimate is much better to be omitted.

Some people will pretend to make an estimate, without even inquiring into those circumstances which must regulate the expence, knowing that when the sum they mention is expended, their employer will not stop the building on that account. It is best to be cautious in dealing with such people, unless they will contract for the sum estimated.

as being almost a certain opening for imposition. The best way, therefore, to ascertain this, is to choose a plan; if the proposed building is not of that extent or importance to require the aid of an architect, employ any person conversant in those matters, whose fidelity can be relied on, to examine the ground, and to consult with different tradesmen concerning the expence at which they would undertake to execute their respective parts: a pretty correct estimate may thus be obtained. Or the plan may be laid before different intelligent tradesmen, and their estimates required; and afterwards particularly examined into, not only as to the charges made, but the manner of executing the work; for it is not always the lowest estimate that is to be preferred. If in either case the sum should amount to more than is proposed to be laid out, the dimensions of the plan, and the manner of finishing some of the parts, may be altered, till it is found that it may be executed for about the sum proposed.

SECTION III.

Barns.

In most parts of England the size of barns, consequently the great expence laid out upon them, appears very far to exceed what is necessary for such buildings. This extent of building is by many thought requisite for the purpose of storing the crop in the straw; a practice so prevalent in many places, that it may not be improper here to examine into the motives for doing so.

The principal reasons why many English farmers are so partial to housing their corn, are said to be these:

First, because it is built at less expence in the house than in the rick-yard. Secondly, because it is better secured, and saves the expence of thatching and of thatch. And thirdly, because it is always at hand to be thrashed.

The first of these reasons appears to be quite imaginary; for surely the care necessary to be taken to build in the barn so compact as is generally done, in order to keep out vermin, as is supposed, and to make it hold the greater quantity, must be attended with full as much expence as building in the rick-yard, perhaps more; for in a large barn, the distance to throw the sheaves, and the number of hands requisite to carry them to their proper places for packing close, will be attended with more

expence and labour, and more loss of time, than building in the rick-yard. The second reason seems also to have little weight; for although neatness in every thing is much to be commended, there is certainly no necessity for consuming either so much time or so much thatch in covering stacks as is done in many places. If they are thatched sufficient to keep out rain, and secured properly to resist a blast, it is all that is requisite; but to bestow as much labour and expence on covering a stack which will probably stand but a few weeks, as in covering a permanent building, is surely most completely absurd, and totally inconsistent with that dispatch which ought to be observed in all the operations of farming, particularly in the harvest time, when a farmer should always be in a hurry; for it ought to be a general rule with every farmer, especially at that time, never to lose a moment, but to make the most of the present hour, and on no account to delay or trust any thing to the next; but to consider, however fair the prospect may be, that the next hour, or next day, may be so changed as to put it out of his power to proceed with his operations. On this principle, which is founded on reason and prudence, corn should be put in the stack whenever it is ready for it, which it will certainly be several days before it can be ready to put in a large barn.

No stack should be above 10 or 12 feet in diameter, but most barns are from 20 to 24 feet wide. Is it to be wondered at then, that corn piled to such a thickness contracts a mouldiness? It would be much more extraordinary if it did not, for it is indisputably evident, the nearer the external air is admitted to the heart or middle of the stack or mow, the less chance there is of its being injured, and the sooner it may be stacked. That even farmers themselves are sensible the admission of air is necessary, is clear from the pains they take to have air-holes in their barns: why then will they act so contrary to their own conviction, and to common sense, as to pile up their corn within a building, when it can be so much better aired in the rick-yard; and even to pack it so close that no air can possibly be admitted, when at the same time they have numbers of air-holes for the very purpose of admitting it.

As gaining time to get a crop in safety is so precious an object to the farmer when his corn is cut down, it might perhaps be an easy and a safe method to build it in oblong ricks, rounded at the ends, as shown in Plate V. fig. 1. which might be done very soon after it is reaped. The width of these ricks to be according to the state of the corn, that is, from five or six feet, to about eight feet, but not more; or perhaps as wide as nearly the length of two sheaves, so as to give them a sufficient hold

of each other to bind properly. Their length may be of any extent judged most convenient. The advantages of this mode are, 1. That the corn may be much sooner put together in safety than in the common way. 2. That staddles for building these ricks on will be very easily and cheaply erected. 3. That the expence of thatching will be less than in round stacks of the same contents. 4. That they may be finished and thatched at one end, before the other is completed. 5. That when wanted to be thrashed, by beginning at one end no more need be taken down than requisite or convenient to thrash at that time, and that end may be secured from the weather by tarpawlings, or otherwise, or by a sliding cover, on the same principle as his Majesty's ingenious moveable barn, at Windsor. Stacks built in this manner, or even in the common way, are therefore most undoubtedly preferable to housing the corn, and may even be built at much less expence than in a barn.

The expence of thatch is but trifling, for after it comes off the stack it will answer the purpose of litter for work-horses or cattle, equally well as it did before.

If a farmer has not straw sufficient to thatch his stacks, he may, with a thrashing mill, get as much in half an hour, or an hour, as he has occasion for.

Here is another great advantage of a thrashing mill, for, if properly constructed, although it may bruise the straw a little, it does not cut it so as to prevent its answering the purpose of covering stacks; for which purpose oat or barley straw, drawn even, and properly laid on, will do sufficiently well, as can be testified by the experience of many.

The third reason for housing corn, is so much overbalanced by the advantages pointed out in the objections to the other two, that it is unnecessary to enlarge upon it; besides, as no farmer who studies his own interest, and the great importance of dispatch in all his operations, will ever now think of using a flail if he can get a thrashing mill; he must be satisfied that no such reason can, in that case, have the smallest weight.

The great and principal object with a farmer, when his crop is cut down, besides securing it from vermin, is to preserve it in the completest manner from wet or dampness, or becoming mouldy. To attain this, after being properly secured from external moisture, it must be acknowledged, that a free admission of air is absolutely necessary.*

* It is observed that all sorts of corn in the straw, soon after it is built in a stack or mow, generally sweats a little, or what in some places is called, *comes again*, however dry it may have been put up.

On a tour lately made through great part of England, I had many opportunities of examining the condition of corn and straw piled up in large barns, and I observed but very few instances where the mow had not contracted a considerable degree of mouldiness; besides, they were so infested with rats and mice that the damage done by those vermin must have been immense, although some farmers seemed to consider it as a mere matter of course, and gave themselves no trouble about preventing it.*

Security from vermin, and a free ventilation, being so essentially requisite for the preservation of corn in the straw, and as these cannot be obtained if lodged in a barn, so effectually as by building upon proper staddles in a well aired rick-yard, it is hoped that farmers will adopt this method more generally, which would not only be the means of increasing their profits, but by abolishing those large expensive barns,

This will happen in a greater or lesser degree, according to the state of the atmosphere at the time of its being put together. If this is the case, which every experienced farmer must know, it is evident that without a free admission of air it is hardly possible, after this sweating, to restore the mow to its former dryness, or to prevent it contracting a mouldiness that must greatly injure both the corn and the straw.

* It is wonderful that husbandmen should be so blind to their own interest as to suffer the depredations of those mischievous vermin, without using every effort to prevent it. They loudly complain of the hardships of the clergyman's dues, but allow those useless and destructive depredators to prey upon their property, unmolested and uncomplained of. In every county, and every parish, there ought to be associations for the purpose of destroying and annihilating those vermin. We are told, that in one county † the tenants in the neighbourhood of a wood, conceiving themselves greatly injured by the immense numbers of crows resorting to that wood, entered into an association for the purpose of destroying them; they assessed themselves at the rate of five shillings, and latterly at two shillings, per plough; out of this fund they paid a bounty of a penny a head for old crows, and from 2*d.* to 6*d.* per dozen, as the season advanced, for young crows. The first six or seven years above 10,000 to 7 or 8000 were destroyed annually; and in thirteen years 76,655 were in all destroyed, the expence of which cost £142. 14*s.* being a trifle short of 38 shillings per thousand; whereas, if the damage done by a crow in one year is estimated at one penny only, the waste committed by a thousand will amount to about 4 guineas.‡ But the rat is far more destructive than the crow, especially when we reckon the damage they do to sacks, harness, &c. and the difficulty and expence of cleaning wheat when mixed with their dung.

Were such associations general, and a premium given for every rat destroyed, they might soon be extirpated, and an immense quantity of grain annually saved to the nation.

† East Lothian.

‡ See East Lothian Report.

would lessen the expence of farm buildings so much, that a landlord would not consider it so very serious a matter to give his tenants a new and commodious set of offices when necessary. Where the flail is used, the greatest pains should be taken on the construction of the barn-floor; in making which there are various ways practised for rendering them as firm and as dry as possible. Flues, or drying-floors, might also be used, and would be very beneficial in damp seasons. But these subjects will be found more fully explained in another work.*

Notwithstanding the housing of corn in the straw appears so perfectly unnecessary, and even so detrimental, yet as many people are partial to this method, the few following plans are given of barns calculated for that purpose; afterwards are those on a different construction for thrashing mills, the principal difference being, that the latter are not so large, and have granaries above; for where the former kind are already built, there would be no difficulty in erecting a thrashing mill within them also, if required.

SECTION IV.

Granaries.

THE limits intended for these general observations will not permit, nor is it necessary here to enter into, a particular description of the granaries constructed in different countries, and of the various modes there practised for preserving grain.

Perhaps in this country the importance of public granaries is not so great as in many others, and therefore the means of preserving grain for a length of time the less necessary to inquire into.†

Every farmer and dealer in grain knows the care and attention requisite to preserve

* Pract. Treatise on Rur. Imp.

† It is said that in some countries, particularly in several parts of Africa, in Russia, Poland, Switzerland, &c. great expence and labour are bestowed in storing and preserving corn for times of scarcity. In some of those places, large deep pits are dug in the solid rock, with only one entrance at top just wide enough to admit a man. The grain is deposited carefully therein, and the external air excluded by covering the opening very close and tight. Over this a ridge of earth is raised, and well beaten together, to throw off the rain, lest any should soak in. In such pits, which must of course be

corn for any length of time, even after it is put in the granary, and also the great extent of flooring necessary to spread any considerable quantity upon.

With a view of facilitating the labour of frequently stirring the grain, and of lessening the expence of such buildings, a member of the Society for the Encouragement of Arts, Manufactures and Commerce, in a letter to Dr. Templeman, recommends a new-invented granary, of which he gives the following description, but without any drawing.

" The granary I would recommend consists of seven stories of floors, and may be built in any dimensions, provided proper proportions are adhered to. The form of it is square, suppose 14 feet square within the rooms or cells. The distance from the floor of one cell to the floor of that above, is five feet; and the whole building should stand on strong posts, more or less in number, according to its dimensions, at the distance of six feet from the ground. The small stairs, or rather ladder, to go to the several cells, must be fixed to the outside of the building sideways, with a leading rail or rope, to prevent falling. The whole granary to be built of what is generally called brick noggin; that is, it is first framed in strong timber work, and the interstices filled up with brick. The floors, beams, and joists, must be made strong, to bear the weight of the corn. The inside of the cells must be well lined with dry oak board, close jointed, and the outside must be weather-boarded, the boards being strongly nailed to the timber work of the frame, and afterwards payed over with pitch. The floors of the cells must be so contrived as to shelve towards the middle, in which part is to be an aperture six inches square, to be opened or closed by means

in a very dry situation, and the corn also perfectly dry when deposited therein, we are told that grain has been preserved sound for many years.

In other places large granaries are built so as to admit a free ventilation, and a frequent stirring of the corn.

Some authors condemn a free access of the external air, because (say they) it brings with it the eggs of a vast number of different insects, which prey upon and destroy the corn; and they advise against the too great humidity which (they add) always prevails where there are many doors and windows.

Nevertheless, at Zurich in Switzerland, where the granaries are extremely well aired, by a great many square wooden pipes which pass through them, it is said that corn has been known to keep perfectly sound therein upwards of eighty years.

Mons. Du Hamel recommends a mode of preserving corn by ventilation, and mentions several experiments he tried with his ventilators, which he found to succeed, even when in some cases the corn was put up extremely moist.

of a sliding shutter, which must have a long handle reaching, in a groove, without the granary.

" On three sides of the rooms there must be a window, strongly letticed, covered with wire, to keep out large insects and birds, and with strong shutters, to defend the corn from the weather. On the fourth side is a door to each room to open from without. The windows are to be small, and as close as possible to the ceiling.

" Over the upper room or cell is a loft, on the outside of the door of which is fixed a crane, to be worked within by a winch and fliers. The use of the windows in the sides of the rooms is to give the corn all the benefit it can receive from the wind and fresh air. The door, when the cell is empty, admits the workman to sweep, dust, and clean it. The method of managing corn in this granary is as follows:

" When the wheat is properly cleaned it is hoisted in sacks to the loft above, and emptied through a hole for that purpose in the floor. The apertures in the floors of the cells being all open (except the two undermost, which are closed by the sliding shutters), the grain falls through till it reaches the undermost cell but one: when this is filled to the height of about two feet, which may be seen through the windows, the aperture in the floor of the next cell above is shut by its slider. This being filled in the same manner, the next above it is also shut; and so on till the whole are filled, if required, except the undermost, which is left empty. In this condition the corn is left for a week, or more, if it was got in very dry.

" When it is to be stirred the floor of the undermost cell is swept very clean, the door is again shut, and the slider in the floor above drawn back, which allows the corn to fall through into that cell. When the cell above is empty, the slider is again shut, the floor swept very clean, and the slider in the next floor over that is opened. In this manner they are all managed, till at last the uppermost cell remains empty; and the windows having all been open while the corn was falling from one cell to another, render great benefit thereto by admitting the current of air to pass through.

" In about a week more the next stirring is given, which is performed in this manner. Under the aperture in the floor of the lower cell, a proper screen is fixed, at the end of this screen is a conductor or spout, to which a sack is hung, its bottom resting on a miller's hand-barrow; the slider is then drawn, and the corn let fall on the screen, from which it runs into the sack: when the sack is full, the slider is for a moment shut, till another sack on another barrow is put under the conductor; the

workman then wheels the first sack to the outside of the granary, and fastening the crane rope to it, it is drawn up by another workman in the loft. The same method is pursued till the lower cell is emptied. If it is necessary to screen all the corn at this time, a small screen is fixed under the aperture of the next cell to be emptied, so contrived as to have a box at the back of it for receiving all the dust, seeds of weeds, &c. that pass between the wires; and this screen is successively fixed under every aperture as the cells are successively emptied. After the first month the corn need be stirred in this manner only once a fortnight, and after the first six months only once a month, unless the weather should prove in autumn very hot and damp."

The advantages of this granary, as described by the inventor, are; that it is built at a small expence; that it contains a great deal of grain in a small compass; and that the grain is easily shifted and ventilated, without the tedious mode of turning it with shovels. This gentleman does not favour us with the slope he gives his floors towards the middle, which must be considerable, in order to make all the grain run out at the aperture; but it is presumed this might be assisted by the workmen, consequently the slope may be the less.

The annexed plan of a granary (see Plate XII.) is perhaps preferable to the above, not only from its cheapness, but from its simplicity, and the easy mode by which the whole body of grain is stirred, and the air conveyed and circulated through every part of it, whatever thickness or depth it is laid, and one floor only is necessary, however high the building may be.

I took this plan from a granary built on his own estate by a very respectable and intelligent gentleman in Cheshire, who has found it to answer equal to his most sanguine expectations.

SECTION V.

Stables.

ALTHOUGH there is no necessity for fitting up a farmer's stables in that style of magnificence which is sometimes bestowed on the accommodation of hunters and race-horses, yet the farmer's horses are nevertheless as much entitled to a comfortable habitation as any of these.

In general farmers are by far too negligent of the accommodation or comfort of their horses. They seem to think that any sort of a hovel is sufficient for a work-horse.

Were they only to bring the case home to themselves, and to consider how refreshing a thing it is, after the fatigues and toils of a day, to have a wholesome room and a comfortable bed to retire to at night, they would perhaps have some degree of compassion on that noble and useful animal, on whose labours and exertions their own comforts so much depend. Eager to obey the will of his (often) ungrateful master, the horse strains every nerve to accomplish his imperious commands. At the conclusion of the day, fatigued, perhaps, till his strength is almost exhausted, how barbarous it is to put this faithful, this valuable servant, into a miserable tottering hovel, where he can neither lay down to take a little rest, nor stand up to taste of his scanty morsel without being wet or besmeared; and this too from the carelessness and ingratitude of those who depend on his exertions for their daily support. If a farmer would only consider how much he is indebted to this precious animal, he never would suffer him to be so shamefully neglected. Is it not the horse that ploughs his ground? is it not the horse that harrows in, and often sows the seed? is it not the horse that carries home the produce? and is it not the horse that sometimes thrashes it out, and always carries it to market? How then can we account for that matchless ingratitude and neglect which is so undeservedly shown to this valuable creature: but that such is the case in many places is a truth too notorious to be denied. If it is likewise considered, with how much more alacrity and vigour a horse will enter the yoke after a night's comfortable repose, than he will do after hardly any repose at all, the farmer will at once see how much it is to his own advantage and profit to pay the strictest attention to the comfort, as well as to the food, of his horses: the difference may be equal to at least an hour's work in a day, or about an eighth part of his labour, the value of which he may easily calculate.

There is nothing more conducive to the health of a horse than a wholesome, dry, and well aired stable, and of such a construction as to keep out the cold in winter, and the heat in summer, with proper drains to carry off every sort of moisture.

We are told by some who have made the management of horses their principal study, that there is no animal delights more in cleanliness, or that more abominates bad smells. And yet how often do we find, even in stables built at a great expence, that they are so wretchedly ventilated, and the effluvia from their dung so disagreeably

powerful, we can hardly breathe on entering them. How much more disagreeable and offensive must it be to the horses themselves, who possess so exquisitely the sense of smelling, to be thus doomed for hours and whole nights together, to breathe the offensive vapours arising from their own dung. Yet, as if that were not sufficient to torment their olfactory nerves, a he-goat is often introduced in the stable; an animal which, of all others, has "the rankest compound of villainous smell that ever offended nostril." There are some people credulous enough to believe that such smells are wholesome, and prevent diseases among horses: for my own part I can never be persuaded that any sort of smell, or the breathing of any sort of air, can be half so salubrious or agreeable to horses or other animals, as the pure unadultered air of the atmosphere. For this reason I would recommend all stables to be extremely well ventilated, especially at the top, where the foul and offensive air may much sooner and easier be conducted away, than at any other part.*

As farm stables are almost always built adjoining to other offices, as indeed they ought to be, it is unnecessary here to give any separate elevations or plans of them, or to say any thing concerning the choice of situation till we come to treat of the arrangement of farm offices in general; but as there are several ways of constructing the stalls, it is hoped the following observations will be sufficient to explain them.

The most common way is to make the rack and manger to extend the whole width of the stall, the upper part of the rack inclining over the manger, as represented in fig. 3. *a b* being the rack, and *c* the manger. Although this is the most general, it is the worst of all constructions, nor is it the least expensive.

Servants are for the most part so sparing of their labour, that in order to save a little trouble they will cram a rack quite full of hay, whatever is its size. Those who are acquainted with the management of horses well know the bad consequences attending this practice, and that it is much better to give a horse little at a time, and often, than to put it in his power to stuff himself with more at once than is good for

* In every stable there should be a few proper sized windows, in proportion to its extent; which windows ought to be so contrived as to open or shut at pleasure, either to admit the air or to exclude the light, as may sometimes be necessary to induce the horses to take a little sleep in the day time. In farmers' stables, when it is not wished to go to the expence of sashes and glass, they may be constructed as shown in Plate XIII. fig. 1. and 2. A is a front view of the window, having a shutter exactly fitted thereto, which is suspended in the middle by two iron pins *b b*, upon which it turns. B is a side view, showing the position of the shutter *c d* when opened a little.

Plate XIII

Fig:1

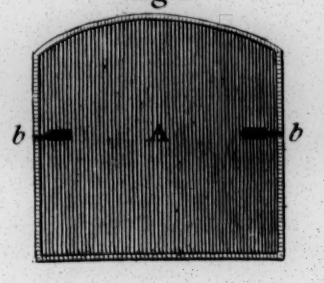


Fig:2

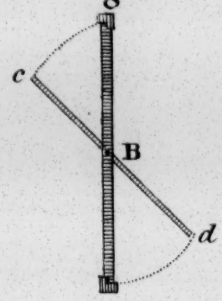
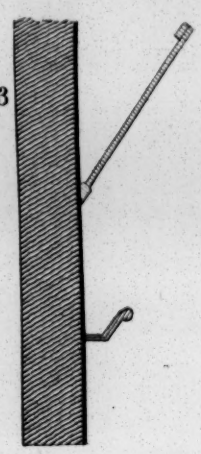


Fig:3



Inside parts of Stables.

Vide Pages 18 & 19.

Fig:4

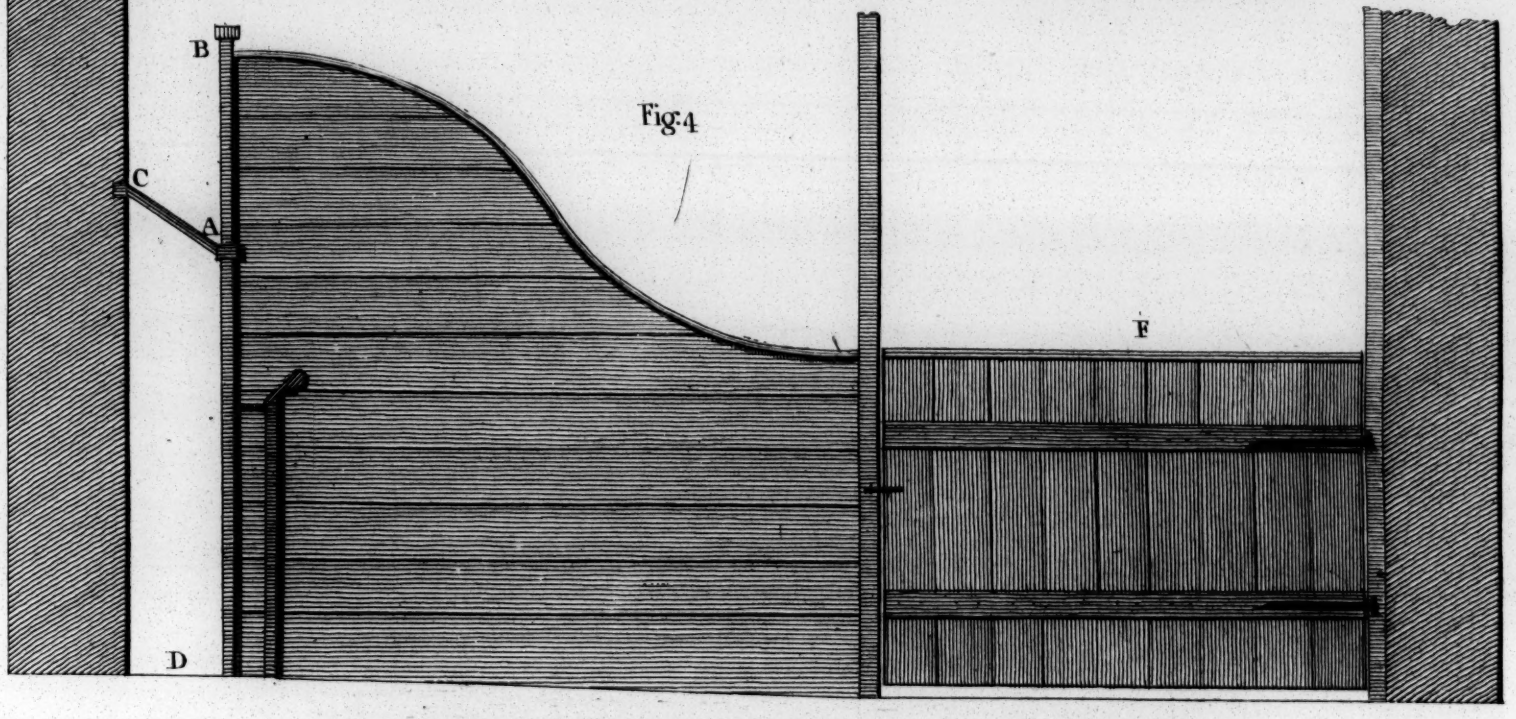


Fig:5

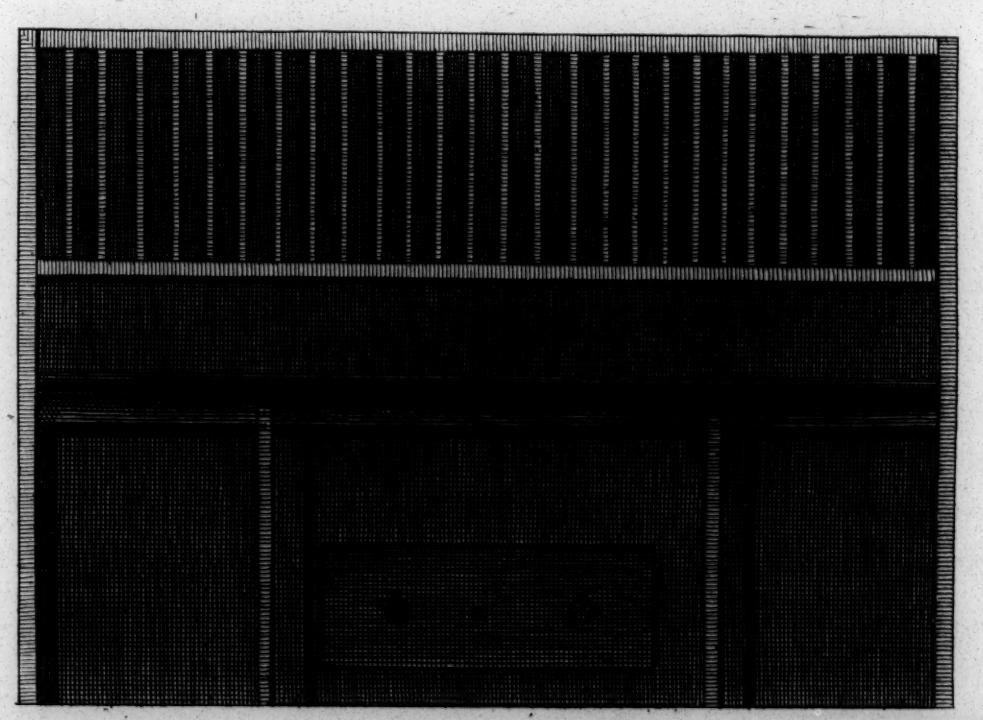


Fig:6

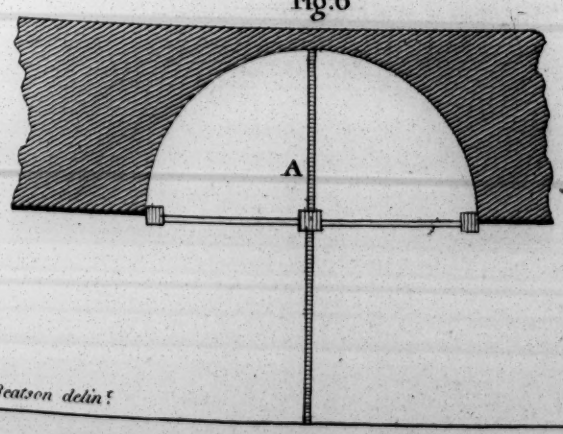


Fig:7

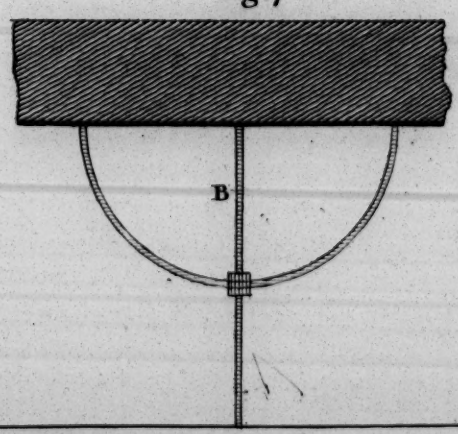
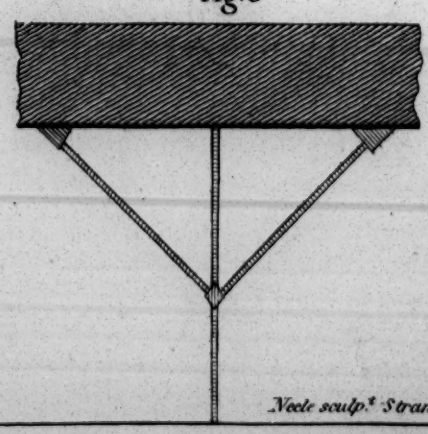


Fig:8



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him; besides, when this is the case he generally wastes a great deal of hay which falls down among his litter; and according to this construction of a rack the whole seed is lost, which if saved, and of good quality, might be of some value to the farmer; for an industrious farmer will save every thing he can; and even the seed of the hay used in his stables is very well worth his attention.

When the rack is inclined outwards in this manner, the seed very frequently, too, drops into the horses' eyes and ears, and is attended with very bad consequences.

For these reasons the rack should always stand perpendicular, at the distance of about fourteen inches from the wall, as shown in Plate XIII. fig. 4. where A B represents the spars of the rack; A C is the bottom of the rack, also sparred, in order to let the seeds fall down towards D, from whence they are taken out by removing a shutter E in fig. 5.

Sometimes there is a niche left in the wall for the rack, the spars of which are in that case flush with the inside face of the wall. This niche and rack, which is supposed in the middle of the stall, need only be about $2\frac{1}{2}$ feet wide, and should be carried low enough to admit a small box or drawer in the under part of it, to receive the seed.

These racks are sometimes made in the corner of the stall, so as to make one niche serve two stalls, as fig. 6; and they are sometimes put in the angle, without any niche, in the form of a semicircle, as fig. 7.

In either case, there should always be a division of the deal betwixt them, as A B, fig. 6. and 7; for it is best for the farmer to know what each of his horses eats, which he can never do when two eat out of the same rack and manger.

When such racks are made in the corners of the stalls, I should rather think it would be better to make them straight than circular; if with niches in the wall, to construct them as in fig. 6; and if in the angle of the stall, as in fig. 8.

There may either be a hatch over each of these racks, or a single hatch for putting down the hay in any other convenient part of the stable, with rails, and a sparred bottom to save the seed; but for farmers it is perhaps the better way to have a hatch for each stall, which will require less time to feed the horses than the other way.

It is unnecessary to make the manger the whole width of the stall; a drawer or box about 18 inches long, by 12 inches broad, or even less, is quite sufficient. This drawer should be made so as to be taken easily out to be cleaned, for it is a great

objection against standing mangers, that whatever drops from the horse's mouth or nostrils, in case of a cold, or any other disorder, is seldom or never cleaned out.

Some stables are constructed without either racks or mangers: the inner part of the stall is boarded for about three feet high from the ground: the boards about two feet distant from the wall: the hay is put into this place; by which, instead of having to pull his hay from above, as is commonly the case, he takes it from below, which is perhaps not only more natural for a horse, but there will be much less waste than by drawing it from a rack, for every time the hay is drawn from the rack, there is generally some of it drops down and is lost; but when it is taken from below, whatever drops falls back among the rest, and consequently none can be lost. It would be proper to have some small spars at the bottom of this place, within about six or eight inches of the ground, and either with a drawer for the seed to fall into, or a board with a couple of rings, to take away when required; or perhaps a better construction would be, as shown in Plate XIV. fig. 1. nearly in the form of a hopper, being only about 14 inches wide at bottom, which is sparred, and a drawer below it for saving the hay-seed. In the corner of the stall is a little box to hold the horse's feed, as described already; and if a double stall, there is a box in each corner, and the hay-manger, if it may be so called, is divided in the middle, as shown by the dotted line: in general, however, single stalls are to be preferred.

The next thing to be considered, is the manner of paving the stalls. For my own part I think that horses ought to stand in a stable as nearly on a level as possible; nor can there be any reason whatever to the contrary, unless that of carrying off the moisture; which I hope to shew may be much more effectually done by paving the stalls level, than in the common way.

A horse's feet are of so much importance to his master, that no pains should be spared to keep them in the best order, and free from every blemish or complaint, for the least flaw, or the least injury there, may render him incapable of work, perhaps altogether useless.

Nothing can be worse for a horse's heels than to make him stand always on a slope or declivity. It not only occasions grease, cracks, scratches, &c. but by keeping the tendons and sinews of his pastern joints in a constant state of extension, causes a stiffness in those joints, which must prevent him the free use of them. Nor can a horse rest so easily on a slope as on a level.

Some writers recommend that part of the stall whereon the horse lies to be covered

Plate XIV.

Stalls,

Vide Pages 20 & 21.

Fig. 1.

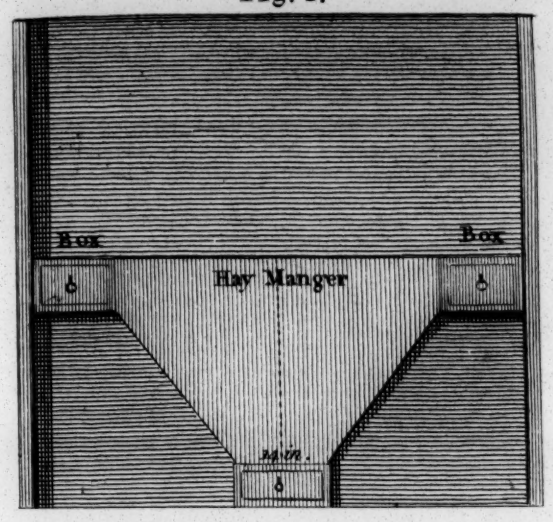
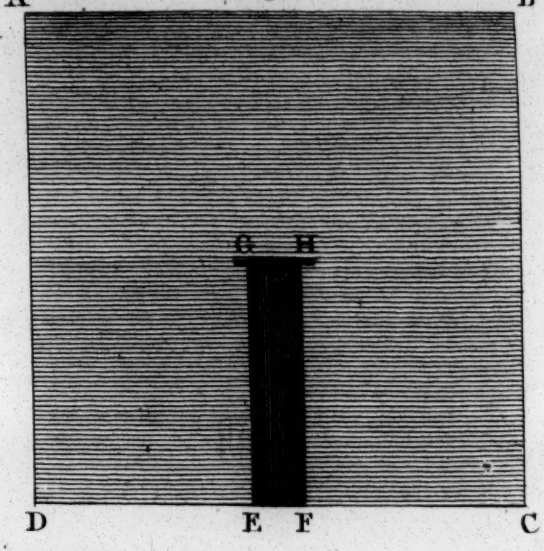


Fig. 2.



Corn Bin?

Pages 22 & 23.

Fig. 5.

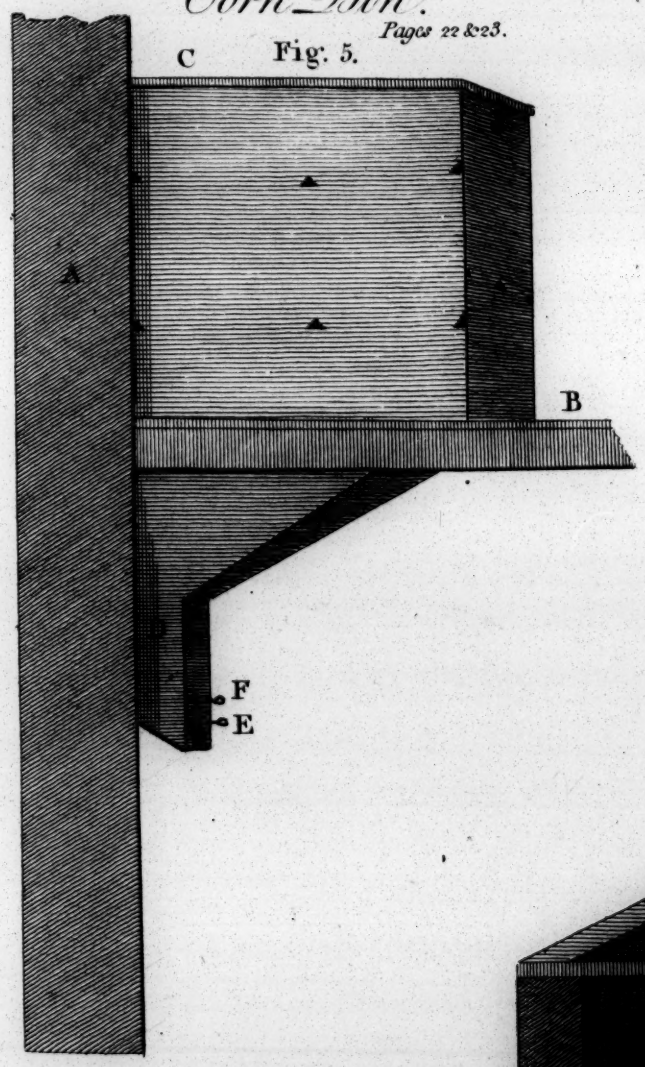
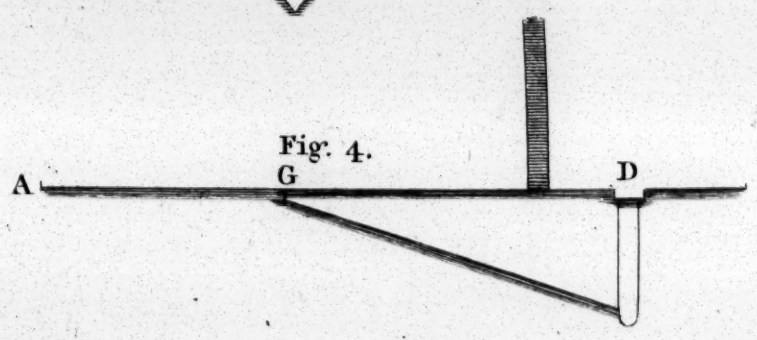


Fig. 3.

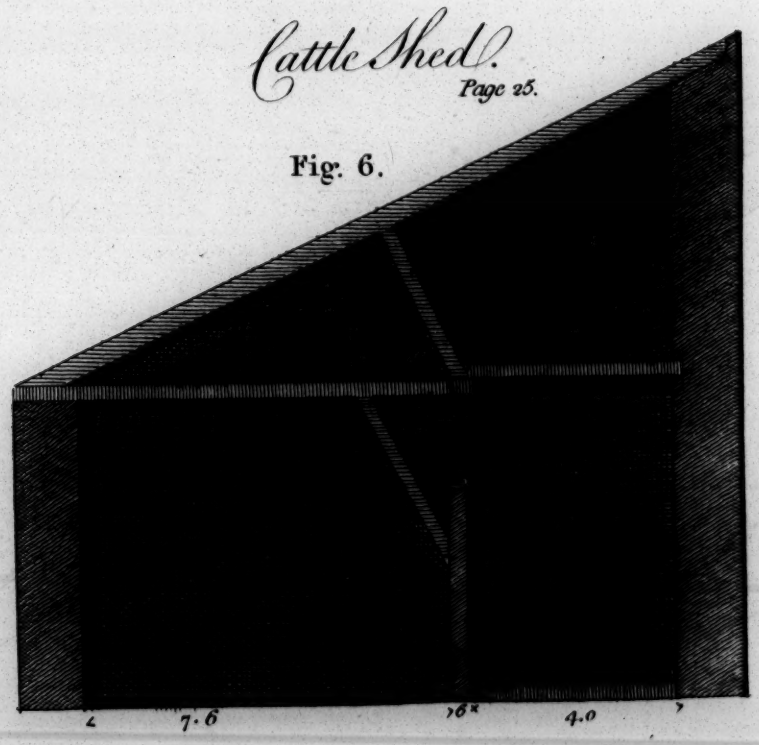
Fig. 4.



Cattle Shed.

Page 25.

Fig. 6.



with oak plank, and holes bored through to carry off the urine. I cannot entirely approve of this method, not only from the additional expence it would occasion (for the planks must be very strong), but on account of the difficulty or impossibility of cleaning below the planks, which in a short time would occasion a very offensive smell, by the stale urine that would lodge there, notwithstanding there might be a considerable declivity to carry it off.

The method I would recommend is this:—Suppose ABCD, fig. 2. the ground plan of a stall. A B is the inner end, to which the horse is fastened. Let it be paved on a level from A to D, and from B to C, leaving in the middle a small drain EFHG, extending to within about three feet of the inner end of the stall. This drain to be about seven or eight inches wide at top, and to form an angle at bottom, as shewn in the cross section, fig. 3. The bottom of the inner end at GH to be only about three inches deep, and to slope from thence outwards as much as conveniently may be, to conduct the moisture away to a main drain at D, shown in the longitudinal section, fig. 4. into which all the stall drains empty themselves.

These stall drains to be covered with a piece of two inch plank, having as many holes as possible bored through, which may be fastened by a hinge, or two iron pins to turn upon at GH, so that it may easily be raised up when necessary to clean it, or wash it below.

The main drain may either be made at the end of the stall, as at D, or in any other convenient place for conducting away the moisture into a reservoir. If at the end of the stall, it should not be nearer than two feet, otherwise the stale of mares might not at once get into it, unless the pavement without the stall were made to decline towards the drain; but in either case the main drain, which need not be above six or seven inches wide at top, should likewise be covered with plank, full of holes.

Instead of this main drain within the stable, there may be a shallow open drain as usual, with a small iron grating over a hole at the end of each stall drain, to which there may be a declivity from each side of the stall.

It must be observed, that the pavement or floor of the stall, instead of being perfectly level across, should decline about an inch, or an inch and a half from each side towards the stall drain; a declivity which will not be perceivable, but will prevent any water spreading towards the sides, in case it does not fall immediately into the drain.

The advantages of this sort of stall are, that the horse always stands upon a level,

and consequently will be less liable to disorders in his feet or heels; that as horses generally stale about the middle of a stall, and as the bottom of the stall drains may have a much greater descent than can be given to the floor of a stall, the urine will be carried off immediately, without spreading to either side, as must be the case in the common method, for which reason horses may be kept dry with less litter, if required.

Stalls should never be less than five feet wide, although I have known them only four feet and a half, and not attended with any inconvenience. The division between them should be so high, at least at the inner part, that strange horses may not see each other.*

Where stallions are kept, or where young horses or others are required to go loose in the stall, it is necessary in these cases to have it so inclosed, that if they were bound, and to break loose, there could be no probability of their hurting each other.

For these reasons there is sometimes a stall or more sparred to the top, or to a sufficient height to answer the purpose required.

Sometimes doors are made, as shown in Plate XIII. fig. 4. at F, which extend from the back post of the stall to the wall of the stable.

At Mr. Eccleston's, at Scarsbrick-hall in Lancashire, the stalls in one of his stables are separated in this manner, which is very convenient, not only in the cases above-mentioned, but when there are several mares and foals, to keep each mare and her foal separate from the rest.

In or adjoining to all stables there should be a dry well aired place for keeping harness, &c.; also a proper and convenient situation for a corn bin, both of which places should be very well secured from vermin. If the stable is small, and it is judged most convenient to have the corn bin in the loft above, I would propose it being constructed as in Plate XIV. fig. 5. A the wall of the stable. B the floor of the loft. C the corn bin, with air spouts, as afterwards described. D a spout below the

* Sometimes stalls are made double, and as farm horses generally work in pairs, each pair that work together have one of these double stalls; for horses are a sociable animal, and it is said they feed better, and are more cheerful when they live in society. But even in this case it is proper they should be fastened to the opposite sides of the stall, and that each horse should have his own rack and his own manger; for although they may seem to have a very great attachment to each other (as it is evident they often have), yet if the dividing of their food is left to themselves, it is more than probable they will quarrel about it, and that the strongest horse will have the best share.

bin, for letting the corn down to the stable. E a slider of plate iron at the bottom of the spout, to open or shut at pleasure, but may be locked by a padlock if necessary. F another thin iron slider, so placed that by shutting it after the spout is filled down to E, there will be contained between E and F exactly a feed of corn, which is taken away by opening E. Then E being again shut and F opened, another feed is let down, which on shutting F is also taken away as before; and so repeated as often as required.

This method would save the trouble of going to the bin above, measuring the corn, and then bringing it down to the stable; and would likewise be done with a great deal more ease and expedition, which are of consequence to a farmer, by saving a good deal of labour where a great many horses are kept, and perhaps a good deal of corn besides.

SECTION VI.

Cow-houses and Feeding-houses (in some places called Byres.)

I JOIN these under one head, because in most respects they resemble each other. The principal difference is, that in some cow-houses there are calf-pens annexed, and perhaps a trifling difference in the construction of the stalls.

The only reason I can assign why calf-pens should be within the cow-house, is that it saves a little trouble to the dairymaid, by having a shorter distance to carry the milk. In general, however, it is a plan not to be recommended.

Every person who has had any experience among cows must know, how naturally, and how forcibly a new calved cow expresses her attachment to her calf. With what care and anxiety, if permitted, she licks it all over, and uses every exertion to protect it from injury. How the tender calf clings to its affectionate mother, as if sensible that to her alone it can trust for protection.—And yet the poor helpless creature is dragged away, and placed perhaps within its mother's view, or at least within her hearing, as if on purpose to augment the pain of her sufferings. Its doleful cries keep alive the pangs of the unhappy cow; she struggles to break the chain that binds her fast, and seems restless and uneasy whenever approached. In such a state of agitation it is impossible she can either feed well, or give that quantity and quality

of milk she would otherwise furnish. Where there are many cows kept, and perhaps several of them lately calved, a single calf may keep them all in this restless state. To remedy which, the best way is to have the calves at such a distance, or at least so thick a wall betwixt them that the cows cannot hear their cries. The cow will then soon forget her calf, and will both feed and milk the better for it.

Cow-houses, or feeding-houses, may be built to answer either the one purpose or the other, and may be in the form of sheds, either single or double. In the latter way, a great many cattle may be accommodated at a very small expence of building.

The principal requisites in these buildings are as follows: 1. That they be well aired. 2. That they are so constructed as to require the least labour in feeding the cattle and clearing away the dung. 3. That the stalls be so formed as to keep the cattle as dry and clean as possible, with sufficient drains to carry away, and reservoirs to collect the urine and dung.

With regard to the first requisite, a free ventilation is as necessary in these buildings as in stables. How often do we see, on entering a house where there are a good many cattle or cows, most of them perhaps in the highest state of perspiration, and smoking as if they had been at the hardest labour; at the same time the whole timbers of the roof completely wet by the condensed fumes arising from the heat and breath of the cattle. This can only happen in close buildings, which must undoubtedly be extremely unwholesome, and I should suppose would prevent the cattle thriving so well as they might do.

To a feeder of cattle, who looks eagerly forward to the profits he is to reap, and who estimates every additional pound of weight that a bullock ought to take on each day, it would be well worth his attention to consider, whether any bullock, in a perspiring state, can fatten so well as when kept in a proper degree of temperature. I think it stands to reason he cannot.

When such buildings are in the form of sheds, they are not so liable to this want of ventilation; but wherever the timbers above appear wet by the heat of the cattle, it is an evident proof there should be some additional air-holes, which, in my humble opinion, ought principally to be in the roof, as recommended for stables. If there are gable ends they should have a window in each, as high up as possible, with moveable boards, as in granary windows, which may, by means of a cord or small rod, be easily opened or shut at pleasure.

The advantages of this free and wholesome ventilation to the cattle, must be very

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Plate XV

Feeding Houses.

Vide Pages 25 &26.

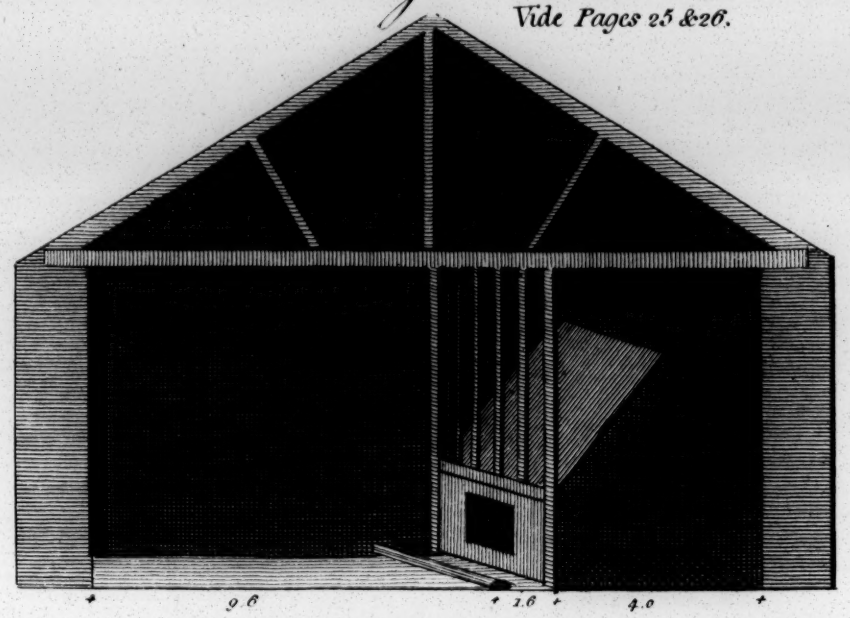


Fig: 2

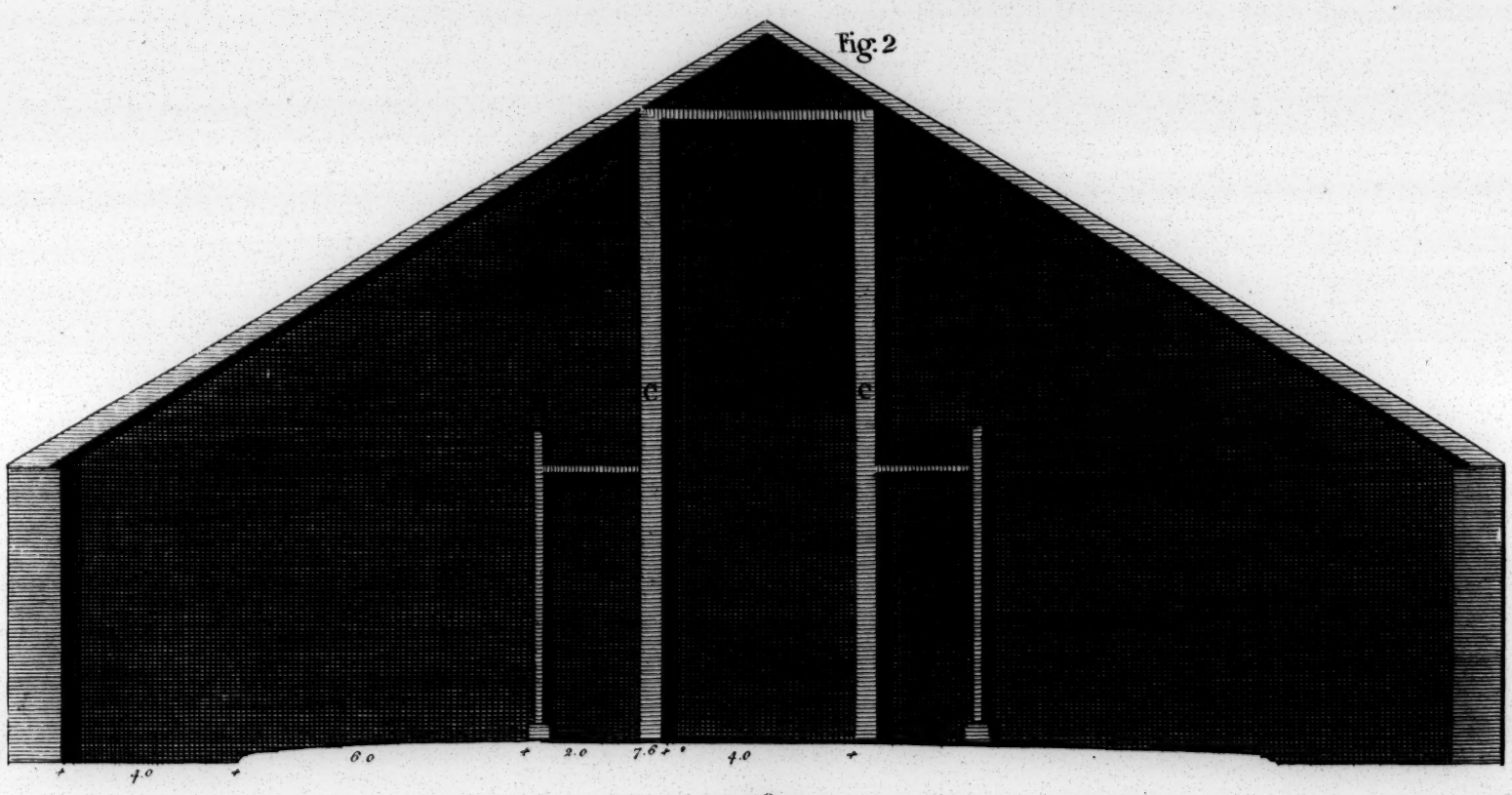
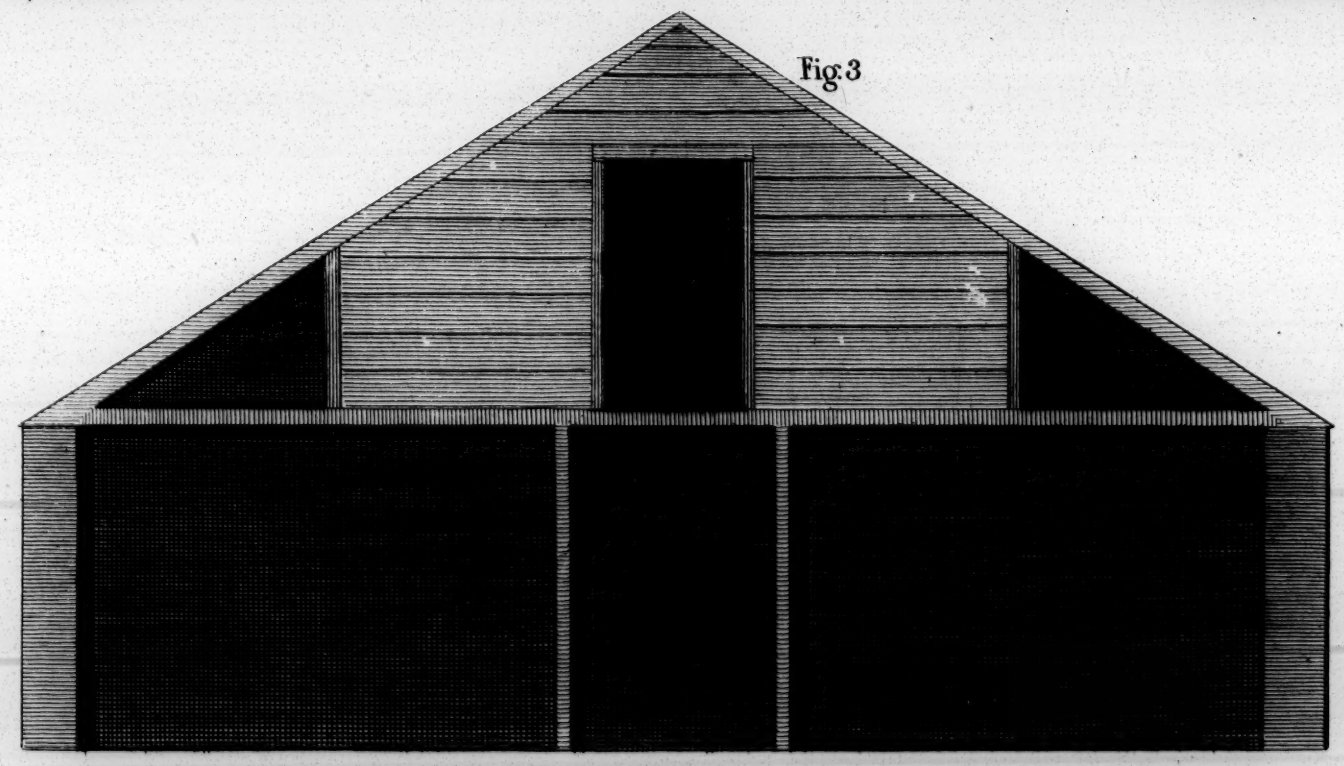


Fig: 3



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evident, and also to the preservation of the timbers of the building; for where the timbers are often wet in this manner, they cannot be of long duration, consequently the expence of repairing or renewing them would be greatly increased.

With respect to the second qualification, there are various constructions of these buildings, but chiefly in the interior part. In many the cattle are fastened to stakes ranged along the wall at the distance of about three feet from each other, with a space of 18 or 20 inches between the wall and the stakes to lay their food in. This is a very general construction in many parts of the country, but it is somewhat remarkable in this, as well as in many other things, that the plan most generally followed, is the very worst that could have been thought of: according to this construction the feeder, except sometimes when the cattle are fed from without, is obliged to go in among them to give them their food, which occasions a great waste of time as well as being attended with many other inconveniences.

No construction can be more commodious than when a sufficient space is left before the cattle, for the feeder to go with a large wheelbarrow to distribute their food. This may be obtained either in single sheds, or in double ones, by making the cattle face each other, and leaving a free space of about four feet to admit a wheelbarrow.

The single ones may be as in fig. 6. A is the passage before the cattle. B the rack for their hay or straw. C a place for laying fodder or litter occasionally. Or it may be constructed as Plate XV. fig. 1. D the passage. E a perpendicular rack, behind which are thin deals all along, in the position F, for laying the hay upon; and under F is a square hole G, opposite each stall, through which the cattle are fed from the passage D. This is a very good construction, and is taken from the new offices at Mr. Bishton's of Kilsal, in Shropshire.

The double sheds are constructed as in fig. 2. A is the passage. BB are the stakes to which the cattle are bound. CC are posts or pillars to support the roof. It might be an improvement here to adopt Mr. Bishton's plan, and make similar racks, with holes below, as in fig. 1.

Another way to construct these double sheds is shown in fig. 3. by which a very convenient loft may be obtained in the roof. A is the passage between the cattle, and B the loft above, which, if close boarded, may serve many useful purposes.

These double sheds are perhaps the best construction for feeding-houses, being not only the most commodious, but less building will be required for the same number of cattle, than by having them all to face one way.

When cattle are fed from the outside through holes left for that purpose, many inconveniences may arise, either in wet weather, in a severe frost, or by a heavy fall of snow. When they are fed within, no sort of weather can occasion any interruption, especially if there is a proper place adjoining, to keep the provender in security and under cover.

In single sheds, it would be convenient to have a place above the cattle, as at C, Plate XIV. fig. 6. for holding occasionally some hay or straw. This place might be boarded, and made to open from without by covers suspended on hinges, which when opened, will afford an easy access for putting in the fodder from a cart. It would there lie ready for the feeder to throw into the racks when required. The roof in this case to be supported by posts or pillars about three or four feet high, on the top of the wall, and placed about eight or ten feet distant from each other, as AAA, &c. Plate XVI. fig. 1. BBB, &c. are the hinges of the covers, and CCC, &c. rings to raise them up. D is one of the covers open, which may be held up in various ways, as by a catch EF, fig. 2. moveable on a small iron pin, the heaviest end E being within the fixed boards, and F without, to catch in a hole in the cover when opened.

Thirdly, great attention is necessary to keep cattle clean and dry. The common method of taking away the dung in wheelbarrows, is attended with a good deal of labour, and where there are many cattle or cows, will require perhaps several men's attendance.*

To preserve dung under cover, would be attended with an expence in the construction of a proper place, that perhaps few would choose to go to; at the same time, there is no object of more consequence to the farmer than preserving the

* If this labour can be abridged, and one or two men's work saved by a proper construction of building, it will be a great advantage. This should be considered in the original design, before the building is begun, and must be determined in a great measure by the form and situation of the ground. If a proper receptacle can easily be had immediately behind the cattle, for throwing in the dung at once with a shovel, without wheeling it, this would be the easiest way, and will not only save labour and expence, but if properly contrived, the dung will be the better for it. By the common method, the dung is in general so scattered about and exposed to the weather, that a great part of its virtues is exhaled and lost: a matter of great importance to the farmer, for it is not merely the quantity, but the quality also of dung that is to be considered. And I will venture to assert, that in many cases, where dung is allowed to be exposed for a length of time to the weather, and thereby rendered almost a *caput mortuum*, that it will take at least three or four loads of it, to produce the same effect, as one load of good dung, with all its vegetative virtues in full vigour.

Plate XVI

Parts of Feeding Houses.

Vide Pages 26 &27.

Fig: 1

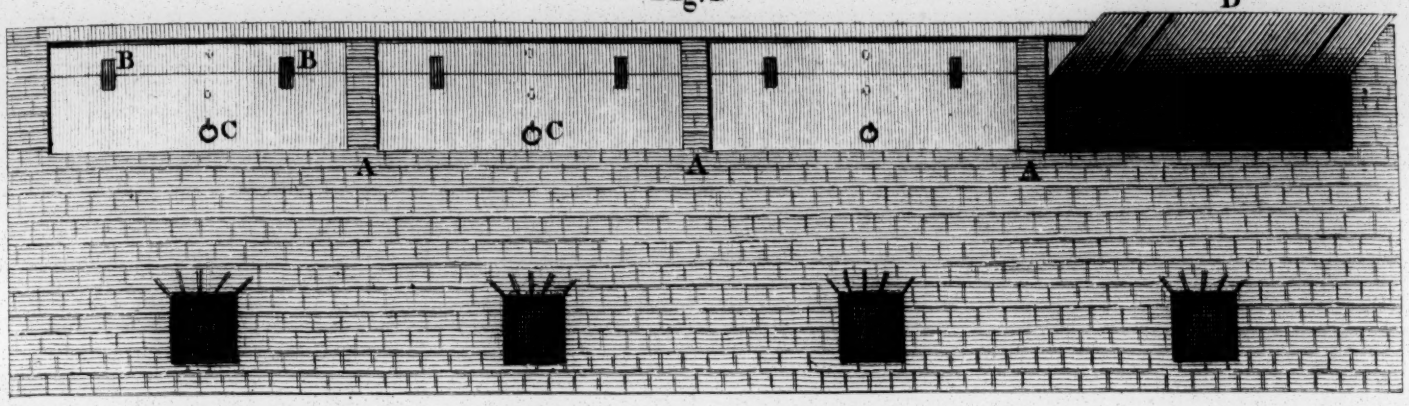


Fig: 2

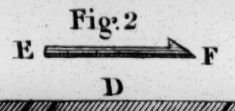


Fig: 3

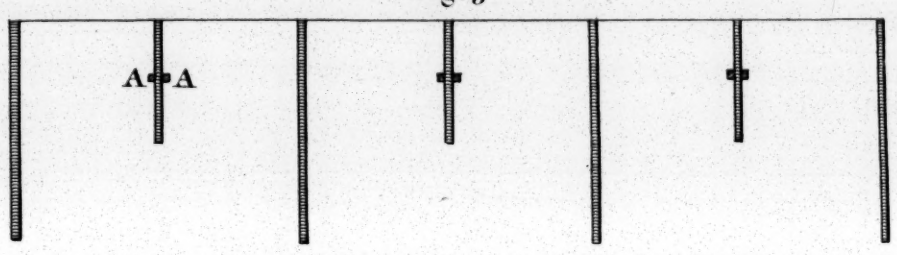
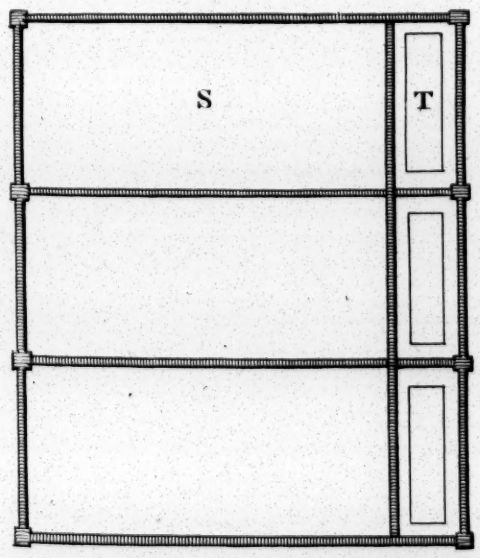


Fig: 4



P

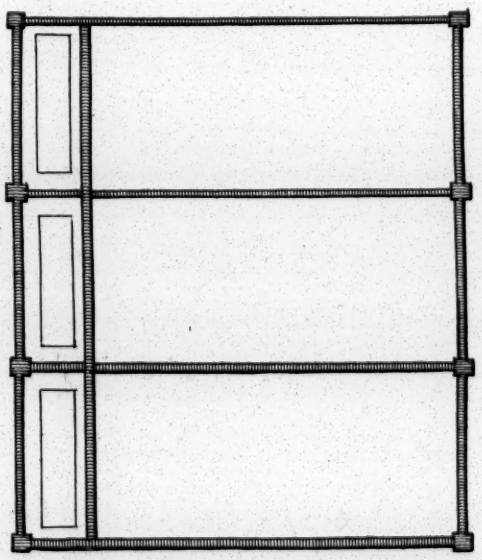


Fig: 5

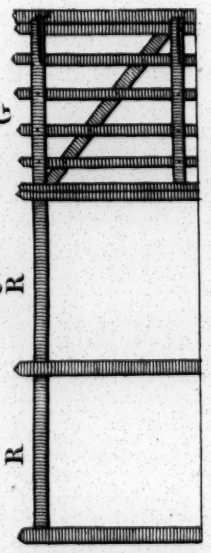


Fig: 6

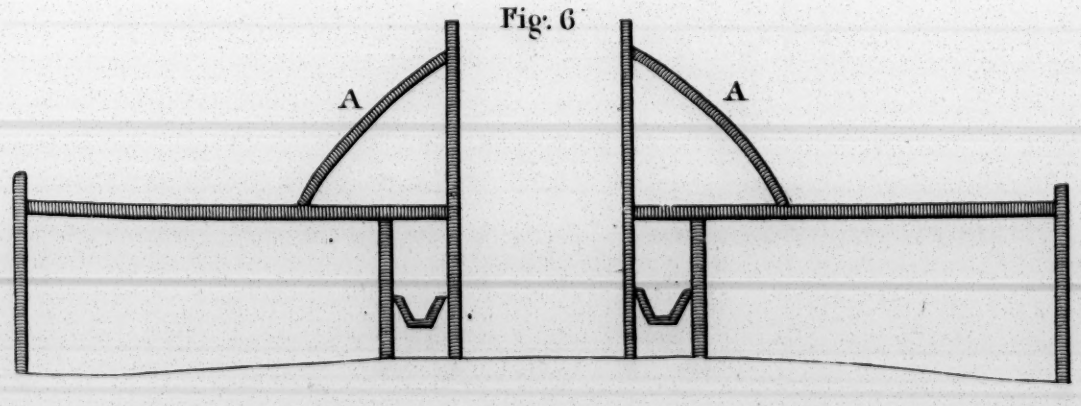


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Plate XVII

Feeding Stalls.

Vide Pages 27 &28.

Fig. 1

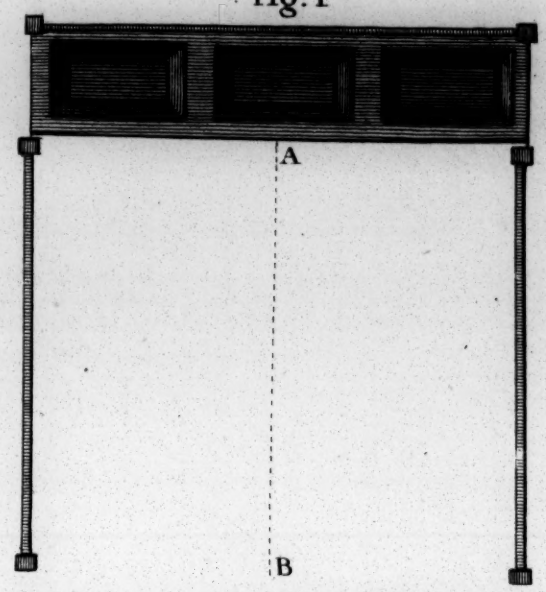


Fig. 2

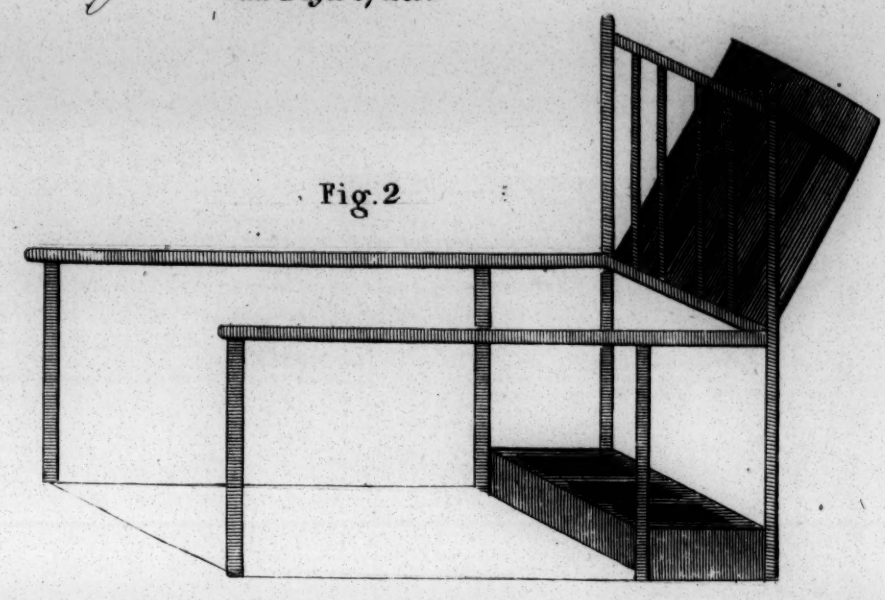
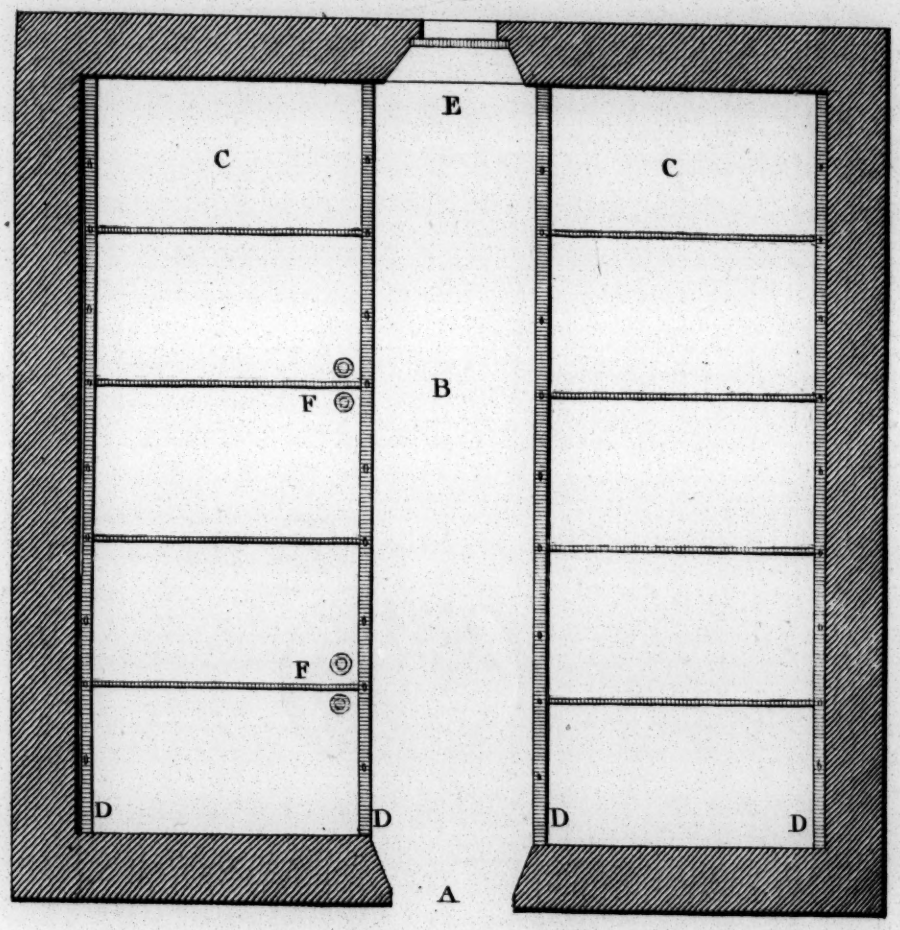


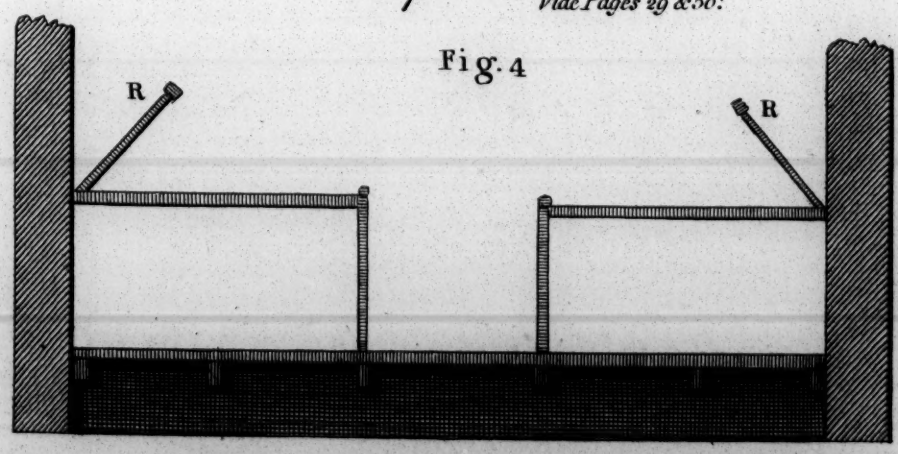
Fig. 3



Calf Pens.

Vide Pages 29 &30.

Fig. 4



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quality of his manure, but as this subject more properly belongs to another paper, it is unnecessary to dwell upon it here.

The facility of keeping cattle clean and dry, depends very much on the construction and paving of the stalls, of which there are various kinds. In many places, however, there is no such thing known as a stall for cows or oxen, they being bound to stakes, without any division whatever betwixt them. In some parts again, particularly in Cheshire and Lancashire, cows are bound in pairs, at least there is but a very small division betwixt them, as will be seen by fig. 3. which is a plan of these stalls. AAA, &c. being the stakes to which the cows are bound.

In other parts they are not bound at all, but every cow or ox has a separate stall, so divided from the rest by rails of wood, that they cannot get out, and so narrow that they cannot even turn about. Fig. 4. is a plan of these stalls; SSS, &c. are the stalls. P is the passage betwixt them. TT, &c. are the troughs out of which the cattle feed. Fig. 5. is an elevation of the rear of these stalls. R is a rail that lifts out at the end of each stall. Sometimes there is a little door that opens as at G. Fig. 6. is a section of these stalls, in which it will be observed there is a short rail or brace at A, to prevent the cattle touching each other with their horns. Some people are of opinion, that cattle feed much better and quicker in stalls of this kind, than when they are bound.

Double stalls may be made without the short division, as already mentioned. The division between them, however, ought to be sufficiently boarded at the top, to prevent the cattle seeing their neighbours in the next stall. At each stake should be a trough for holding meat, and between these two troughs, another one, common to both cattle, for holding water, with which it may be supplied by a pipe communicating with a cistern or reservoir without. These three troughs may be of stone, Plate XVII. fig. 1. and all of one piece, if thought proper. A perpendicular rack for holding hay or straw may be placed over them, as represented in fig. 2. which is a section or view of one of these stalls, and fig. 1. is a plan. Perhaps it would be an improvement to divide them by a rail in the middle, as at AB, fig. 1. which would prevent the cattle turning too much about, and spreading their dung over the whole stall, for the more they are made to dung in the same place the easier it will be to keep them clean.

Although the double stalls here recommended, are a good deal used for milch-cows in different parts of England, yet they have in general only one trough for each cow, without any for water; nor indeed have I seen any with this conveniency, except at

Burleigh, in Rutlandshire, a seat of the Earl of Winchelsea's, whose offices and farm houses are on an excellent construction, being planned chiefly by himself. His farms too are in the best order; and the experiments he has made on the feeding of cattle, and on raising a crop of turnip, for spring food, among a crop of beans, as well as many other useful experiments, shew the very great attention his lordship bestows on improvements in agriculture.

In paving stalls for cattle, there is generally too great a declivity made, which will cause them always to stand uneasy and uncomfortable; for, when feeding, there cannot be too much attention paid to their ease and comfort, as well as to their food. If they are constantly wet and dirty, or in pain by standing in an unnatural position, it is impossible they can thrive so well as otherwise they might. Yet how little attention is there in general paid to this. One would almost be led to suppose it is the opinion of many, that if they *stuff* their cattle quite full of food, whatever may be its quality, it is all that is necessary. Sometimes they are chained so close to a stake that they can hardly move: nay, it is a practice in some places, to fasten their heads between two stakes, by which they can neither lie down in comfort, nor can they have it in their power to destroy or to dislodge those teazing tormenting vermin which frequently prey upon them. Besides this, they are often suffered to be besmeared to the back, and either smoking with heat for want of ventilation, or shivering with cold. No animal can thrive well under such mismanagement, let his food be ever so plentiful, or of so good a quality; for as an ingenious author says, "to keep cattle clean and well littered, is to them half food."*

* Cows are more easily kept clean than oxen, for they do not wet their stalls so much; but even oxen, when confined to stand nearly in the same place, cannot wet their stall above half way up, if properly constructed, and that generally about the middle. It is therefore clear, that if the moisture is immediately conducted away, and prevented from spreading, the ox will be easily kept dry. The best way to do this, is in the manner described for paving the stalls of stables, which being there so fully explained, it is unnecessary here to enlarge upon it. Stalls for oxen should be paved in the same manner, but as their dung is of a more liquid nature than that of horses, it would be proper to have some commodious method to carry it off. Perhaps, in some situations, where there is a proper declivity, this might be done by having an iron grating behind each ox or cow, immediately over the stall drain, and as nearly as can be judged to the place where the dung will drop, which, by continuing the drain, or a wooden spout, to a pit or reservoir without, and giving it a sufficient slope, will, with the assistance of the other moisture, run and empty itself therein. If it should require the aid of a broad rake or hoe fitted to the drain, that may easily be applied, especially if those drains are made

The advantages of proper drains to carry off the moisture from within the offices, and reservoirs to collect it in, are very obvious; for without such drains, it cannot be expected that those offices, or the cattle within them, can be kept sufficiently dry. With respect to a reservoir to collect the urine and moisture from the dung, it is of so much consequence to the farmer, that no farm should on any account be without it. Yet it is really wonderful to think, how much this very valuable manure, is neglected, and allowed to run to waste. It would even appear that many farmers took a vast deal of pains to get rid of it, by opening every outlet to carry it off, and conducting it perhaps to some rivulet or stream, that it may the more speedily be taken away from their premises: at the same time, these very farmers are probably sending many miles for manure, not to be compared to it in value. So glaring an inconsistency, it is hoped, there will not in future be many instances of, but that every farmer will consider a proper *urinarium*, as necessary an appendage to his farm, as a kitchen to his dwelling house.

The manner of constructing these, and also the drains that empty themselves therein, so that no rain or other water can mix with the other moisture; as also a plan for collecting the urine in all cities or towns, are fully explained in another publication.*

The next subject to be mentioned is, the construction of calf-pens. Some reasons are already assigned, why calf-pens ought not to be within the cow-houses. Nevertheless, they should be as near as conveniently may be, without being liable to the objections stated.

To lie dry and warm, is of the greatest consequence in the rearing of calves. Some people think it necessary, to accustom a calf to be bound with a halter, from the hour of its being calved. Others again turn them quite loose into the pen, and allow them to range and run about as much as they please. Which of these is the best method, is of little consequence here to inquire into.

The principal thing to be observed in the construction of calf-pens, is the laying of the floor, which should be made of laths or spars about two inches broad, laid at

open, and covered with a strong plank to take up when necessary. The moist dung being thus carried away, the remainder will be easily removed. Something on this principle, suited properly to the situation of the place, would save a great deal of labour, and very much facilitate the keeping of the cattle clean, and would also be the means of saving a considerable deal of litter, if scarce or dear.

* Pract. Treat. on Rur. Imp.

the distance of an inch from each other, upon joists, so as to make the floor about one, two, or three feet from the ground, as the situation will admit. This not only keeps them quite dry, by allowing all the moisture to pass immediately away, but has the advantage of admitting fresh air below the bedding, and thereby preventing that unwholesome disagreeable smell, too often found among calves; for it is to be understood, that this place below the floor should frequently be cleaned, as well as the floor itself, whenever it becomes wet or dirty; but it is not right to allow the litter to increase to a great thickness, otherwise the moisture will not so easily pass through.

Calf-pens are often made without this sparred floor, and the fresh litter always laid on the old, till the calves are removed, which is but a slovenly practice, and not to be recommended.

Stalls, or divisions, are but seldom made in calf-pens. At the same time, it would certainly be much better to keep the calves separate from each other, by which means they will be more easily fed, and less liable to accidents.

Partitions about three feet high, of thin deal nailed on small posts, might be so contrived as to be moveable at pleasure, to increase or diminish the stall if necessary, according to the age and size of the calf. This may be done as represented in fig. 3. which is the ground plan of a proposed double calf-pen for ten calves. A is the door, B the passage betwixt the pens; CCC, &c. are the pens, shewing the situation of the partitions; DDDD are four joists, in which are several holes, as shown on the plan, for receiving iron pins, at the bottom of the partitions, to keep them in their places; E is a window or door, besides which there should be some other windows or air-holes, as high up as possible.

If it is thought unnecessary to make the partitions moveable, there might be a small round trough, in a circular frame, fixed in the corner of each pen, as at F, for holding the milk, and a door in the next adjoining corner. A small slight rack, for holding a little hay, placed at the upper part of the pen, might also be useful. The troughs should be round, that the calves may not hurt themselves upon them, which they might probably do on the angles if they were square.

Fig. 4. is a section of those pens, in which RR shews the position of the racks.

The advantages of this kind of calf-pens are, that the calves are all kept separate in a small compass, and cannot hurt each other, as the stronger ones sometimes do the the weaker, when confined promiscuously; and their food may be much more easily and equally distributed.

If a great number of calves are feeding, as 30 or 40, or more, it might be so contrived in such pens, by pipes communicating with the troughs, that one person might give the whole calves their milk at the same instant of time; and that any given quantity of milk, and no more, can go into each trough; but as this method would probably be but rarely required by the farmer, it is unnecessary, in a general point of view, to enter into an explanation of it.

SECTION VII.

Dairies.

THE profits arising from a well managed dairy, are, in general, so great, and in the opinion of many, so much superior to what can be obtained by any other method of husbandry, that no farm should be without the necessary accommodations for carrying on that business to a certain extent, according to the nature and size of the farm.

By negligence and inattention in the construction of those accommodations, as well as in the management of the milk, the farmer's, or dairyman's profits, are often much diminished, and the quality of his butter and cheese rendered so bad, that it becomes hardly saleable; for on the construction of the dairy, and the order in which it is kept, the quality of these in a great measure depends.

There is nothing so attractive, or so tenacious of whatever affects the scent of the ambient air, as milk or cream, and particularly so, of the taste or smell of the vessels in which they are put: even the state and the temperature of the atmosphere, have the most visible influence on milk, as is evident from the effect produced by thunder, and the different sorts of management requisite in making butter or cheese, according to the warmth or coldness of the air.

With respect to the dairy-house and utensils, the utmost care and attention to cleanliness are indispensably requisite, otherwise, it is in vain to attempt making either good butter or good cheese. The smallest speck of filth, or even of sour milk, left about the utensils, will most unquestionably give a bad taste to the butter or cheese; and milk spilt any where in the dairy, and allowed to grow sour before it is cleaned away, or any thing else producing a bad smell being permitted to remain within the

dairy, will have the same effect, particularly on butter, and will at once infallibly shew the sluttishness of the dairymaid, or carelessness of those who superintend her. In short, the most perfect nicety and cleanliness are absolutely necessary throughout the whole progress of the milk, from the udder of the cow till it is made into butter or cheese; to obtain which, no pains or labour should be spared or thought too much.

Having premised these things, the easiest mode of accomplishing them is next to be pointed out, and this, in a great measure, will depend on the construction of the dairy.

There are three kinds of dairies, namely, a butter dairy, a cheese dairy, and a milk dairy. The names of the two first sufficiently point out the nature of each. The last is chiefly near great towns, where the milk is disposed of as it comes from the cow.

A well constructed butter dairy should consist of three apartments; a milk-house, a churning-house, with proper boiler, &c. for scalding and washing the implements, and a room for keeping them in, and for drying and airing them, when the weather will not permit it without doors.

A cheese dairy should also consist of three apartments; a milk-house, a scalding and pressing-house, and a salting-house. To these might be added a cheese-room or loft; but as this is generally separate from the dairy, it is not here included, although it might with great propriety be above the dairy.

A milk dairy requires only a good milk-house, and a room for scalding, cleaning, and airing the utensils.

Attention to the temperature of the air, being of so much importance in the making of butter or cheese, it naturally follows, that the dairy should be so situated and contrived, as not to be greatly affected by the heat of the sun in summer, nor by the coldness of the air in winter, although in winter it is, perhaps, easier to give it a proper degree of heat, than to keep it sufficiently cool in summer: for this reason, a northern exposure is the best, and this as much under the shade of trees or buildings as possible; for if it can be so situated that the sun can have no influence either on the roof or walls, so much the better.

If there is no apartment above the dairy, a thatch roof (which on no other account should be recommended) laid upon tile, being less liable to the influence of the sun than any other, might be the best; but, as it should always be endeavoured to have

some apartment above the dairy, very well aired, in this case the nature of the covering is of the less consequence.

Stone walls are to be preferred to brick, being, when of a proper thickness, neither so pervious to the heat in summer, nor to the cold in winter.

The state of the air being so necessary to attend to in the management of a dairy, it would be an object of great importance to ascertain the most proper temperature for carrying on the different operations therein to the best advantage; a matter by no means certain, even among the most experienced dairywomen. It is said that a dairy cannot be kept too cool in summer, and that in winter the aid of fire is generally necessary. A medium degree of heat or cold, it would therefore appear, is the best, which we shall suppose is between 40 and 50 degrees of Fahrenheit's thermometer; suppose 45. If this were correctly ascertained, a thermometer would be a most useful implement in a dairy, and it might be kept always at that degree, either by cooling the dairy in summer with spring water, or warming it in winter by stoves.

Some are of opinion, that the ceiling of the milk-house ought never to exceed seven feet in height from the floor, and that the upper part of the windows or lattices should be as high as the ceiling, and on opposite sides; by which the steam arising from the warm milk will be the more quickly carried off. Others again think the dairy cannot be too lofty, imagining it may then be the easier kept cool in summer.

For my own part, I can see no good reason for making it exceed eight feet in height; and whatever may be its height, the upper part of the windows should certainly be the same, as no warm air can then stagnate near the ceiling, which would be the case if it were loftier than the windows. These windows should all be latticed, and slight frames fitted thereto, with gauze stretched upon them, to give a free admission of the air when required, and to keep out flies and other insects.

The floor should be laid with the best freestone flags, made as smooth, and jointed as close as possible. Square paving bricks, properly jointed, may do when flags cannot easily be got; but the best floor of all, where it can be obtained or afforded, is marble, or the beautiful black slate got upon Lord Penrhyn's estate in North Wales. In either case, the floor should have a gentle declivity towards the middle, or the most convenient place for carrying off the water with which it is washed and flooded in hot weather.

Around the walls should be shelves (if the dairy is on a small scale) neatly fixed, to hold the milk vessels. If the dairy be large, cisterns or coolers should be fixed

(instead of shelves) to hold each of them about a meal of milk, never allowing it to exceed three inches in depth. These coolers may be lined with lead, from which there need be no apprehension, if kept perfectly clean. Marble would make excellent coolers, as I should suppose would likewise Lord Penrhyn's slate, before alluded to, which rises to any thickness, and takes a polish almost equal to marble.* In the bottom of the coolers should be a spigot, or plug, and a cock for letting out the milk, or the water when washing them. There should also be a water cock at the back of each cooler for letting in water to wash them; likewise a larger cock in any most convenient part of the dairy, for throwing water on the floor to clean it, or to cool it in the summer. Where there is a sufficiency of water, there might even be a small fountain, or *jet d'eau*, made to play in the middle of the floor; which by throwing up the water would tend greatly to keep the air cool and wholesome in warm weather.

In order to give the dairy a proper degree of warmth in the winter, a flue might be conducted from either of the fires in the churning-room, or place for drying and airing the utensils; which flue should be so contrived, that its communication with the dairy may be stopped when required.

The walls and ceiling should be plastered very smooth, and no cracks allowed to be in them, which might harbour dust or spiders; neither of which ought ever to be permitted in a milk-house, or any part of a dairy. That part of the walls from the coolers or shelves to the ceiling, is sometimes finished with small glazed Dutch tiles, which have a very neat and clean effect. Sometimes there are only four or five courses of these tiles, being about 18 or 20 inches above the coolers. Even this has a very good effect, especially if the upper tile is finished with a neat border, as some of these sort of tiles often have.

The churning-room should be contiguous to the milk-house, and should be provided with a fire-place and furnace, with a proper boiler for heating water to scald the dairy utensils; also for the purpose of warming the air in cold weather, when it is necessary to bring it to a certain temperature, for the more advantageously making the butter. A pump, with spouts for filling the copper, is also very convenient, and a cock below to empty it.

The room for holding the utensils should also have a small fire-place, for airing and drying them properly, when the weather will not permit it to be done without doors; but when they can be dried in the sun, it is always the best way; and there should be

* In Leicestershire they find that common slate of flag answers the purpose perfectly well.

proper stone shelves without for that purpose. This room also serves in cold weather for the cream to stand in near the fire, to air it a little before it is put in the churn, which is found to be a great advantage to it. The greatest care must be taken to prevent either of these places from smoking, for there is nothing more apt to communicate a disagreeable flavour to milk or cream, than smoke; or allowing the utensils to remain where there is smoke.

These two latter rooms are sometimes made to serve for other purposes, particularly at the dairy of the ingenious Mr. Wakefield, near Liverpool, who, by having an additional copper in the churning-house, uses it occasionally as a brew-house: and the latter room, by having a proper table in it, is sometimes used as a laundry. Over these places there may be beds for the dairymaids, or the other servants.

The milk-house of a cheese dairy, ought to be constructed nearly on the same plan as that already described; for even in this it is not always that the whole milk and cream are made into cheese, in which case the coolers, as already described, will be useful; but where the whole is generally made into cheese, it will, perhaps, be more convenient to have shelves for putting the milk utensils upon, as those utensils will be convenient for carrying the milk to the cheese-tub, or to the copper when necessary to warm it.

The pressing, or scalding-house may be on the same construction as the churning-house already described, which will make it answer either purpose; only, if for making cheese, there should be a proper cheese-press within it; which is much more convenient than having it without doors, as is often the case. The salting-house, as used in Cheshire, should be well aired, and kept very clean. It should be laid with flags, having a gentle declivity to carry off the water when the floor is washed; and a stout shelf or table will be necessary, for laying and turning the cheese upon till fit for being taken to the cheese-loft. In or about the salting-house there ought always to be a quantity of small sand kept ready for scouring the utensils, shelves, &c.

The cheese-loft, or cheese-room, as it is often called, may be over the dairy, although it is generally made above the cow-house, and sometimes over the kitchen, the warmth of either being thought greatly to forward the ripening of the cheese. The floor is covered as equally as possible with meadow hay, for the knots in straw are said to make impressions on the cheese, which very much disfigure their appearance. In the cheese-lofts of Mr. Sutton, near Northwitch, in Cheshire, (who had then 54 cows) I saw near 400 cheeses, all lying in the highest

order, each cheese weighing about 140 pounds weight, one of which he makes every morning.

As there are no milk dairies, excepting near large towns, and as these (when the whole milk is sold from the cow) will require but few dairy accommodations, it is unnecessary to give any particular directions for the construction of them. If they should happen to partake partly of the one sort and partly of the other, which is frequently the case, the directions already given, and the observations made on butter and cheese dairies, will, it is presumed, be sufficient to explain the accommodations necessary. At the same time, though it is pointed out what are the most useful conveniences about a dairy conducted on a large scale, yet in common farms, or in small dairies, some of those conveniences may be omitted, although the general principles here laid down ought invariably to be attended to.

The following is a description of Mr. Wakefield's dairy near Liverpool. Plate XVIII. fig. 1. is the plan; A the milk-house; *aaa* the coolers; *b* a slab for laying on butter after it is made up; *ccc* cocks for drawing off the milk from the coolers, one being made to serve two coolers, by a short piece of leaden pipe from the holes *ooo*, which are stopped by a plug *p*, being made sufficiently long to extend above the surface of the milk; *d* a large cock to throw water on the floor, which slopes a little from that part; *eee* are also cocks at the back part of the coolers, for letting in water; *f* is a door, latticed as in fig. 2.; *g* is another door most commonly used, but pannelled. B is the churning-room; *h* a fire-place; *k* a boiler; *l* a large copper, used when brewing. C room for drying or airing the utensils, also used occasionally as a laundry. Over these are apartments for the servants. Fig. 3. is a view of the inside of the dairy at the end Q.

Mr. Wakefield's horse machine for churning, shall be explained in the chapter on implements, where the various sorts of utensils used in the dairy, and a great variety of churns, and different modes of churning, will be pointed out.

SECTION VIII.

Sheds, Straw and Root-houses, Poultry-houses, and Hogsties, &c.

Besides the buildings already mentioned, there are several other conveniences necessary about a farm, the construction of which is so simple, and depends so much

Plate XVIII

Dairy.

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Fig:1

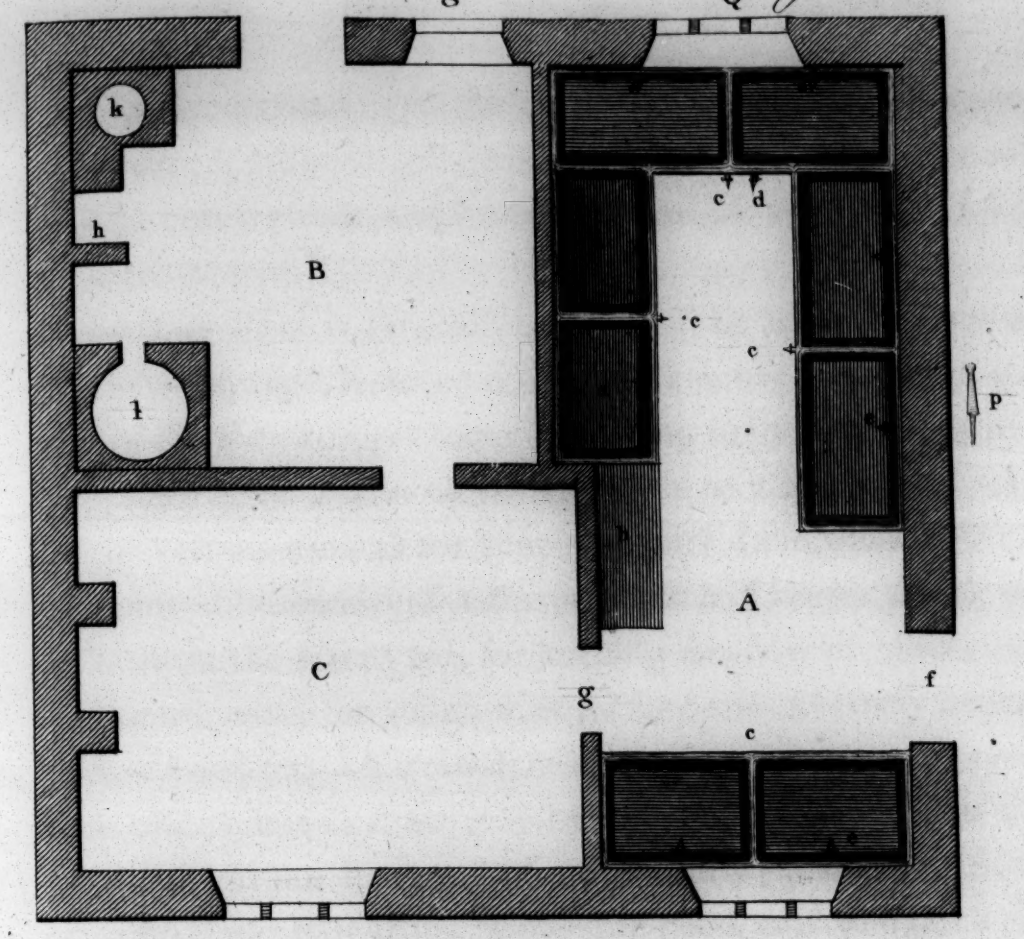
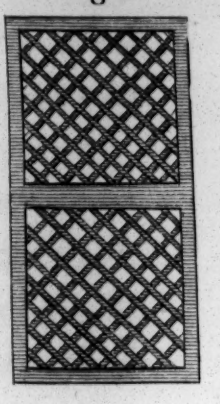


Fig:2



Steam Boiler

Page 44.

Fig: 8

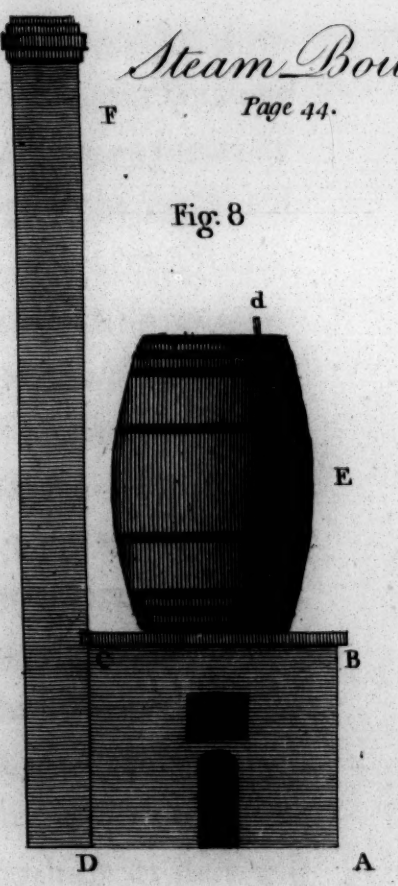


Fig: 3

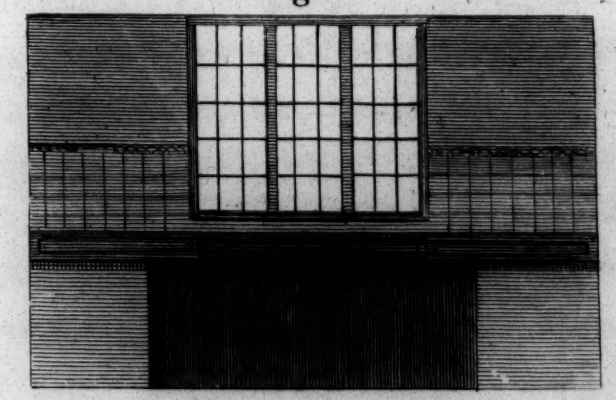


Fig: 4

Fig: 5

Swine Troughs,

Page 40.

Fig: 6

Fig: 7

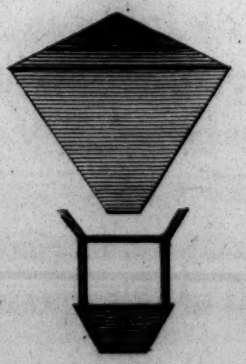
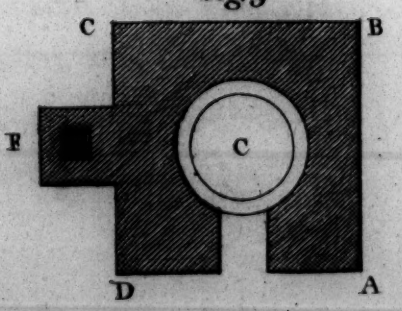


Fig: 9



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upon the construction of the other buildings that it is unnecessary to enter into a particular description of them; we shall therefore only submit the few following general observations, and leave the plans of those buildings till we come to the general arrangement.

Sheds.—What is generally understood by a shed, is when a roof, consisting of only one side or slope, leans or rests upon another building or wall to support the upper part of it; the easing or lower part being supported either by stone or wooden pillars. The same name is also sometimes given to a whole roof resting upon pillars. Sheds are of various uses, as for keeping secure from the weather all sorts of the larger implements of husbandry, for the protection of horses, cattle, or sheep, when allowed to go loose in the farm yard, for keeping meadow or clover hay, and for various other occasional uses; for which reasons they are extremely necessary in all farm yards.

Straw-houses.—A straw-house is also sometimes allowed in the arrangement of farm offices, but as straw may be built sufficiently secure in stacks, a house for storing it in, will not be found of much utility (unless for holding a small quantity occasionally), especially if the farmer has good tarpawlings, or painted cloths, as formerly recommended when treating of barns, which he can always lay upon the stack till quite completed.

Root-houses.—Are perhaps more essential, particularly where many cattle or cows are kept. They are chiefly used for piling of cabbages and winter roots, which is very necessary, not only in case of a heavy fall of snow, or a severe frost coming suddenly on, but that they may be the more at hand when wanted. Potatoes being more liable to injury by frost than almost any other root, should be kept as well secured therefrom as possible. In Lancashire, Cheshire, and several other places, potatoes are generally piled in the field, and covered over with earth formed into a ridge, like the roof of a house, and well beat down, in such a manner that the rain runs off to a drain which is cast all round the heap. The manner of doing it is as follows: the space intended for the potatoes to lie upon is covered with straw, they are then laid on the straw in an oblong form to the breadth intended, and piled up as high as they will lie; then they are covered with straw, which is drawn even like thatch, and laid so as to meet it in an angle at top. A trench is then cast all round, the earth from which is laid over the straw of a sufficient thickness to keep out frost, being well beat down with the back of a spade; there is generally about six inches thickness of straw, and as much of earth. The only risk from heavy rains in this method is, that it enters at

the ridge. If instead of making the ends of the straw meet on the ridge, the middle were laid on there, and so bent down, it might prevent any rain entering, which it is presumed but seldom happens when proper pains are taken.

Poultry-houses.—Poultry if rightly managed might be a source of great profit to the farmer; but where many are kept they ought not to be allowed to go at large, in which case little profit can be expected, for not only many of their eggs will be lost, and many of themselves perhaps destroyed by vermin, but at certain seasons they do a great deal of mischief, both in the barn yard and in the field. No doubt they pick up some grain at the barn doors that might otherwise be lost, but if the straw is properly thrashed and shook, there would be very little of this. In the common careless way of thrashing, a great deal of corn is undoubtedly thrown out among the straw; but when we consider the dung of the fowls, and their feathers that get among it, and the injury these may do to the cattle, this is no object. It is much better to allow the poultry a certain quantity of corn and other food, and to let the cattle have the benefit of what corn may be among the straw.

Poultry ought therefore always to be confined, but not in a close, dark, diminutive hovel, as is often the case; they should have a spacious airy place, properly constructed for them. Some people are of opinion, that each sort of poultry should be kept by itself. This, however, is not absolutely necessary, for all sorts may be kept promiscuously together, provided they have a place sufficiently large to accommodate them conveniently, and proper divisions and nests for each kind to retire to separately, which they will naturally do of themselves.

This method is practised with great success at Mr. Wakefield's, near Liverpool, who keeps a large stock of turkeys, geese, hens, and ducks, all in the same place: and although young turkeys are in general considered so difficult to bring up, he rears great numbers of them in this manner every season, with little or no trouble whatever.

He has about three quarters, or near a whole acre, inclosed with a fence only six or seven feet high, formed of slabs set on end, or any thinnings of fir or other trees split and put close together. They are fastened by a rail near the top and another near the bottom, and are pointed sharp, which I suppose prevents the poultry flying over, for they never attempt it although so low. Within this fence are places done up slightly (but well secured from wet) for each sort of poultry; also a pond or stream of water running through it. These poultry are fed almost entirely with potatoes

boiled in steam, and thrive astonishingly well. The quantity of dung that is made in this poultry place is also an object worth attention; and when it is cleaned out, a thin paring of the surface is at the same time taken off, which makes a valuable compost.

The most magnificent poultry place perhaps that ever has been built, is at Lord Penrhyn's, at Winnington, in Cheshire: it consists of a handsome regular front, extending about 140 feet: at each extremity is a neat pavilion, with a large arched window. These pavilions are united to the centre of the design by a colonnade of small cast iron pillars painted white, which support a cornice and a slate roof, covering a paved walk and a variety of different conveniences for the poultry, for keeping eggs, corn, &c. The doors into these are all of lattice work, also painted white, and the framing green. In the middle of the front are four handsome stone columns, and four pilasters, supporting likewise a cornice and a slate roof, under which and between the columns is a beautiful mosaic iron gate; on one side of this gate is an elegant little parlour, beautifully papered and furnished; and at the other end of the colonnade a very neat kitchen, so excessively clean, and in such high order, that it is delightful to view it. This front is the diameter or chord of a large semicircular court behind, round which there is also a colonnade, and a great variety of conveniences for the poultry: this court is neatly paved, and a circular pond and pump in the middle of it. The whole fronts towards a rich little field or paddock, called the poultry paddock, in which the poultry have liberty to walk about between meals. It happened while I was there to be their dinner time, at one o'clock. At this hour a bell rings, and the beautiful gate in the centre is opened. The poultry being then mostly walking in the paddock, and knowing by the sound of the bell that their repast is ready for them, fly and run from all corners, and rush in at the gate, every one striving who can get the first share in the scramble. At that time there were about 600 poultry of different kinds in the place, and although so large a number, the semicircular court is kept so very neat and clean that not a speck of dung is to be seen. This poultry place is built of brick, excepting the pillars and cornices, and I believe the lintels and jambs of the doors and windows, but the bricks are not seen, being all covered with a remarkably fine kind of slate from his lordship's estate in Wales. These slates are closely jointed and fastened with screw nails, on small spars fixed to the brick; they are afterwards painted, and fine white sand thrown on while the paint is wet, which gives the whole an appearance of the most beautiful freestone.

Hogsties—Are of simple construction; they require only a warm dry place for the swine to lie in, with a small area before, and troughs to hold their food. They are generally made with shed-roofs, and seldom above six or seven feet wide.

Although swine are generally considered as the filthiest of all animals, yet there is no animal delights more in a clean comfortable place to lie down in, and none that cleanliness has a better effect upon with respect to their thriving and feeding. In order to keep them dry a sufficient slope must be given, not only to the inside where they lie, but to the outside area, with proper drains to carry off all moisture. The inside should also be a little elevated, and have a step up from the area of at least five or six inches. Hogsties should have several divisions, to keep the different sorts of swine separate, nor should a great many ever be allowed to go together; for it is thought they feed better in small numbers, and of equal size, than when many are put together of different sizes. Proper divisions must therefore be made, some for swine when with the boar; others for brood swine, and for them to farrow in, for weaning the pigs, for feeding, &c.

Swine are apt to spill and waste a great deal of their meat by getting their feet among it, unless proper precautions are taken to prevent them. This may be done by making a rail or covering of thin deal slope from the back part of the trough towards the fore part, as in fig. 4. leaving just room enough to admit their heads. There should also be divisions across the troughs, according to the number of swine, to prevent the strongest driving away the weakest. These divisions need not extend to the bottom of the troughs, but should rise a little higher than the top, and may be made of pieces of board about eight or ten inches broad, as represented in fig. 5 and 6.

Another way to prevent them wasting their food, would be to have shallow wooden troughs placed about a foot from the ground; above these, large deep troughs, open at bottom, and placed as shown in the section, fig. 7. In the upper trough the meat is put, but no more can get down than what rests on the bottom of the shallow trough, and when that is eat up, a fresh supply will always succeed from the upper trough. For food of a liquid nature, as milk, whey, &c. there may be a stone trough below, as at *a*, and spars or holes in the bottom of the shallow trough to let it pass through. Troughs of this kind may be made to serve two divisions at the same time, by being placed betwixt them.

A small stream of water running through a sty in an open spout, so that the pigs can easily get at it to drink, would be of great service.

Sties ought to be constructed that the swine may be easily fed, without going in among them. In some places it is so contrived that they may be fed through openings in the back kitchen wall, without even going out of doors. This is very convenient, where only a few swine are kept for family use, and makes it easy to give them the refuse of vegetables and other things from the kitchen, which, perhaps, would otherwise be thrown away.

Pigs' kitchen.—In some places, where many swine are kept, there is what is called the *pigs' kitchen*, which is nothing more than a furnace and copper placed in any convenient situation near the sty, for boiling their meat; but as it will be shewn afterwards how to boil potatoes, and other vegetables, in steam, it will then be easily understood how to construct a *pigs' kitchen* on this plan.

Coal-houses.—There are very few parts of the country so fortunately situated, but fuel becomes a very necessary article of care and attention; and no part where it is not an article of considerable expence. Every provident farmer will take care to lay in during the summer season, while roads are good, as much fuel as will serve him in the winter. It therefore becomes necessary to have a proper place to store it in, for it is too valuable an article to allow being exposed to every intruder.

Coal-houses, or coal-yards, are generally without any roof or covering; but it is much better they should be covered, as coal is materially injured by being exposed to the sun and the weather. And in those countries where great coal is burnt, it is best to keep the great and the small coal separate, and to have a place also for keeping cinders.

Wood or Peat houses.—Where coal is not generally burnt, or perhaps difficult to be got, it is necessary to have a good store of wood or peat. These should also be laid in during summer, and must be well secured from wet or damp. The great and the small, or brushwood, should be piled separate. The former to be cut in short billets, according to the length of the grates or fire-places they are to be burnt in. The latter should also be cut short, which will make it stow in less room; and will be a very proper job for the farmers' servants when they have nothing else more material to do.

Workshop.—In every extensive farm, a workshop is very convenient and necessary, not only for making and repairing all sorts of implements, but for keeping all the different parts of ploughs, carts, wheels, &c. blocked out, in order to be properly seasoned; for it is of the utmost consequence to the farmer to have all his imple-

ments made of well seasoned timber, which he never can be certain of getting unless he keeps it ready blocked out in his own possession. In this workshop should be a proper set of carpenters' tools, a bench for working on, and a lathe for turning naves of wheels; also a grindstone for sharping tools, &c.

Timber-yard.—Adjoining, or near the workshop, should be a timber-yard, with a sawpit. If sufficient room can conveniently be obtained, this might be at one end of the workshop, under the same roof. In this yard should be kept, not only all sorts of rough timber proper for making and repairing implements, but also all broken or old implements, old palings, and any other pieces of sound timber, which, however small and useless they may appear, will most probably be of some use at one time or another. Whatever is unsound and fit for no other use, should be put into the wood-house for fuel.

Tool-house, or Store-room.—A shed or house for keeping the larger implements, has already been mentioned. There are several other sorts of implements, or tools, of a smaller size, necessary about a farm, which ought to be taken care of, especially as many of them are but seldom used, and therefore are apt to be stolen or lost, unless carefully laid by; such as spades, shovels, forks, rakes, scythes, reaping-hooks, riddles, sieves, hoes, wedges, quarry tools, &c.; to which may be added sacks, ropes, twine, and even old iron and old nails. A small, dry, well aired place for keeping all these sorts of things, is very convenient; and of such a place the farmer himself ought always to keep the key, otherwise he may often be at a loss to get things he thought himself sure of finding.

Meal-house, or Meal-room.—Many farmers, when they cannot get so good a price for their corn as they expect, or when there is a prospect of meal rising in price, grind their corn, particulary oats, in the northern parts of the kingdom, and keep the meal till they get a good price for it. This very frequently, indeed generally, turns to good account; for it mostly happens, that meal rises considerably, before harvest, that the new crop comes in. At all events, it is the most profitable method for a farmer to turn his corn into meal as soon as possible, provided he has a proper place for storing it up. Many substantial reasons might be adduced for this practice; but a statement of these more properly belongs to a treatise on agriculture, than on farm bu ldings. It would be superfluous to enforce how necessary it is to have a meal-house, as dry and well aired as possible. It is equally necessary to have it perfectly secure from vermin; for there is nothing that rats and mice will so eagerly strive and

persevere to come at, as meal. An upper floor is, therefore, the best situation for a meal-room, or in a dry place on a ground floor, provided proper and well jointed strong meal-chests, or *girnels* (as they are sometimes called) are set there for holding the meal. Whether kept in chests or in cells, the meal should be hard pressed to make it keep well; which may be done by a small iron roller, or ramming beetle, or by treading upon it with the feet. This last is the most common, although not the most cleanly way.

Servants' room.—In large farms, where many servants are kept, especially single men, it is necessary to have a proper place for them to sleep in; and, if they provide their own victuals, a place to dress them in. It is extremely hazardous to allow servants to have the management of fires in any out building contiguous to farm offices, unless the utmost precaution is taken to prevent an accident; as the slightest negligence in that respect, may, in a very short time, occasion the most dreadful devastation. For this reason, it is best to have the servants' room so situated, that if any accident from fire were to happen, no injury could be done to the offices. A neat simple cottage, at a little distance, might be the safest way.

To guard against any such accident as much as possible, the floors should be of stone, of brick, or of plaster, as in several parts of England, which makes an exceeding cheap and safe floor for an upper apartment, or even for a loft of any kind.

Plaster floors.—In Nottinghamshire, these plaster floors are much used: and at the Earl of Winchelsea's, in Rutlandshire, the upper floors of his farm houses are also of plaster. But as these floors are, in general, so little known, it may be of some utility to give a short account of the manner of constructing them.

The joists are laid as usual; then a sort of reed, found chiefly in Huntingdonshire, is nailed on, and the plaster laid upon these reeds; but, to save plaster, there is sometimes laid on first, a thin coat of common lime to fill up the inequalities. The plaster is then spread upon this, about two inches thick, and should be laid on as quickly as possible. This plaster is sold at the kiln for 6*d.* per bushel. The expence of laying it on, if burnt and prepared, is 5*d.* per square yard. If to be burnt and prepared by the workman, about as much more. These make excellent cheap floors, and are very proper for farm houses or cottages. Where reeds cannot be got, laths may do, but they are much dearer. The cultivation of those reeds ought, therefore, to be most particularly encouraged, for they are not only an excellent material for floors, but for covering roofs.

The sleeping place for the servants, may be made to accommodate several men in a small compass, by having fixed beds placed in double tiers, that is, one over another; by which method four beds will take up no more room than two in the common way. The access to the upper beds may be rendered sufficiently easy by means of steps; and the entrance to them may be made either on the same side with the lower beds, or on the other side, as is most convenient.

Steam boilers.—To a farmer who keeps many horses or cattle, or even swine or poultry, the practice of boiling their food in steam, is so great a saving, and an advantage, that it deserves the most particular attention. At present, however, it is confined to such narrow bounds, that it is known but to very few. The following short description of it will therefore, I hope, be acceptable, and tend to make it more generally known.

The principal food that is boiled in this manner, is that inestimable root the potatoe; the cultivation of which, as now so warmly recommended by the Board of Agriculture, cannot be too generally adopted; for, as a ready and wholesome food to man and beast, nothing excels it; and, what is peculiarly fortunate, it is universally palatable from the palace to the pig-sty.

Potatoes have often been given raw to horses and cattle, but they are found to be infinitely preferable when boiled in steam,* which renders them much drier, and more nutritive, than when boiled in water.

The manner of doing this is simple and easy, and is as follows. ABCD, fig. 8. and 9. is of stone or brick, built in a cubical form, about three feet every way: *a* is the door of a furnace; *b* the ash-pit; *c* is a shallow iron kettle, about 20 inches in diameter, and seven or eight inches deep, placed over the furnace. BC is a flat smooth stone, covering the whole top of the building; in the middle of which, a round hole is cut out to admit the iron kettle being fitted closely in. E is a cask, the bottom of which is perforated with a number of auger holes, and is placed over the steam kettle, which is about half filled with water. The cask is then filled with potatoes, and being closely clayed all round the bottom, to prevent the steam escaping between it and the stone, the cover is put on, also very close: *d* is a short thick plug, put slightly in a hole in the cover, to give air; or this hole may be covered with a piece of lead

* To ascertain this, Mr. Wakefield fed some of his horses on steamed, and some on raw potatoes, and he soon found the horses on the steamed potatoes had greatly the advantage in every respect. Those on the steamed potatoes looked perfectly smooth and sleek, while the others were quite rough.

fitted closely upon it, and moveable on a leather hinge, that it may of itself give way, to prevent the cask being endangered by the steam. F is the flue or vent, which may be built to the wall of any house, or any other most convenient place.

When the potatoes are boiled sufficiently, which may be known by taking off the cover, they are either taken out with the shovel, or else the cask is turned over and emptied into a barrow or tub, and again filled, if necessary.

This is the simplest construction of a steam boiler, but is sufficient to explain the nature of it.

Mr. Wakefield, and Mr. Eccleston, of Scarsbrick hall, use them of this kind, and always give their horses steamed potatoes instead of corn. The former also feeds his poultry, as already mentioned, in this manner; and it is surprising to see in what fine order his horses and poultry are, although they never taste corn.

Steam boilers may be of various other constructions, according to the extent required; and one steam kettle may be made to boil several casks at the same time. Or, instead of casks, there might be fixed boilers, with sliding bottoms, for emptying the potatoes into little waggons, or barrows wheeled in below them. The potatoes might also be taken out of a fixed boiler, by means of an iron basket, made to fit the inside of the boiler; which basket might easily be taken out with a lever, or a small crane.

If the steam boilers are placed near the kitchen, they may be used occasionally for boiling any thing for family use; this method of boiling being found much preferable to boiling in water for most culinary purposes.

Brew-house, bake-house, &c.—Besides the accommodations and conveniences already described, there are several others sometimes built upon a farm, such as brew-house, bake-house, slaughter-house, pigeon-house, apiary, wash-house, laundry, kilns, and stoves for drying grain, cisterns for holding water, wells, pumps, &c.; all which, as also different kinds of steam boilers, are particularly described, and the manner of constructing them pointed out in another work.*

* Practical Treatise on Rur. Imp.

SECTION IX.

Situation and Arrangement of Farm Buildings.

HAVING now got through a description, individually, of all the different sorts of accommodations generally given to a farm; it now remains to show how to arrange them together in the most commodious way. The first thing, however, to be considered, is the choice of situation.

In ancient history we are told, that the Romans were so very attentive and careful in the choice of a good and healthy situation, that they would not even encamp upon a spot of ground, till they tried various experiments to ascertain if it was sufficiently healthy. How much more necessary then, is it to ascertain the salubrity of a place destined for more permanent purposes.

In general, where a choice of situation can be had, these four things should be particularly attended to: a pure and temperate air; the water wholesome, and easily come at; the soil dry, and the place centrical, and of easy access.

No buildings whatever require these qualifications more than farm buildings; yet, in general, it would appear they had been totally disregarded. How often do we see farm buildings and barn yards placed in the very worst situation in a whole farm: in low, marshy, boggy spots, almost inaccessible to man or beast, and fit only for a resort to frogs and wild ducks. Perhaps too, within a little distance, a fine, dry, wholesome situation might have been obtained; for there are few farms of any considerable extent, in which a tolerable good situation for building may not be found somewhere.

If dryness and purity in the air are so desirable and requisite for the site of a dwelling-house, how much more (if possible) are they necessary for farm offices and barn yards. If these are placed in a damp and humid spot, the farmer's whole crop runs the risk of being rendered useless and unsaleable, however dry and well conditioned he may have brought it from the field; for if the place to which he brings it is damp and unwholesome, his grain will soon acquire a softness, and perhaps mustiness, very injurious to its value. On the other hand, if the situation is dry, his grain will not only improve and keep in better order, but in general it will be of a better quality, and consequently worth a better price.

It would be deviating from the plan of these general observations, to enter into a particular detail of the various ways of trying the quality of the air, of the water, and of the soil, which are fully explained in the work so often referred to; as also methods of purifying water, making artificial springs, &c.; we shall, therefore, now proceed to offer a few general rules for the arrangement of farm offices.

In fixing the arrangement of a new set of farm buildings, the first thing to be taken into consideration, after choosing the situation, is the nature and produce of the farm. From these may be judged the different kinds of accommodation that will be necessary. For example, every farm must have 1. A dwelling-house: 2. A barn suitable to the extent of arable land in the farm, either with or without a thrashing mill, but always with one, if possible; and it should be endeavoured to place it so that it may go by water, if a supply can he had. 3. Stables, the dimensions of which must be determined according to the number of horses necessary for the farm. 4. Cow-houses, or feeding-houses, or both, according to the number of cows and cattle; and so on, till the whole accommodations necessary, and their dimensions, are fixed upon.

Having ascertained these, and the situation for building on being also settled, the ground must be carefully and attentively viewed; and if not very even, the different levels must be observed, and the best way of conducting all the necessary drains, and carrying off all superfluous moisture. Also the best situation for dung and urine pits, or reservoirs, which will in a great degree ascertain at once where the cattle-houses and stables should be. These being fixed on, the barn should be as near them as possible, for the convenience of carrying straw to the cattle; and the barn yard should be contiguous to the barn. If a granary is resolved on, that should also be near the barn, or over it; as likewise the straw-house, which should be close to the barn.

These main points being determined on, the others will easily be found; always observing this rule, to consider what is the nature of the work to be done about each office; and then the easiest and least laborious way to perform that work, so far as it is connected with other offices. In case this should not be sufficiently explicit, I shall suppose, by way of illustration, the situation of a feeding-house is to be considered of. The nature of the work to be performed here, is bringing food and litter to the cattle, and taking away their dung. The place from whence the greatest part, perhaps, of their food, and all their litter come, is the barn; therefore the feeding-house should be as near the barn as possible.

If turnips, or other roots, or cabbages, make a part of their food, the most commodious way of giving these must be determined on; whether by having a root-house adjoining the cattle-house, and that filled occasionally, or by having a place to lay them down in, near the heads of the stall, from whence they are thrown in at holes in the wall, left for that purpose.

The easiest method of clearing away the dung must also be considered, according to the different plans mentioned when describing cow-houses, &c.; and the same general rule being observed in determining on the site of all the other offices or accommodations, together with a careful examination of the ground to be occupied (upon which the arrangement of the offices in a great measure should depend); any person conversant in rural affairs, who attends to these particulars, and can lay down his ideas in a drawing, may easily direct the planning and building of a very commodious set of offices.

With respect to the site of the dwelling-house, a few observations have already been made thereon, when treating on that subject, in the first section. In addition to these, I shall now only remark, that although a house, being situated in the middle of a regular front, is, in some points of view, the most pleasing way, and in many situations, perhaps, the best, yet, unless the ground, and other circumstances, in every respect favour such a disposition, I would not invariably adhere to it; for it may often happen, that a much better situation for the dwelling-house may be obtained at a little distance from the offices, and a pleasing enough uniformity be observed in them at the same time.

CONCLUSION.

If any thing contained in the foregoing observations, and the designs which accompany them, shall tend to promote the interests and convenience of that useful and valuable class of people, the practical farmers; or, if they shall meet the approbation of that honourable and truly patriotic Board, for whose consideration they are intended, it will to me afford the most sincere satisfaction: and should my services or assistance, be at any time deemed worthy of future acceptance, I shall be proud to obey their commands, and to afford every aid in my power, to promote the views of so highly beneficial an establishment.—An establishment, for which posterity will ever revere the memory of that illustrious Monarch, under whose benign patronage it was formed, and in whose auspicious reign, it will for ever stand as an æra worthy to be recorded, among the greatest of those important events by which it has been distinguished.

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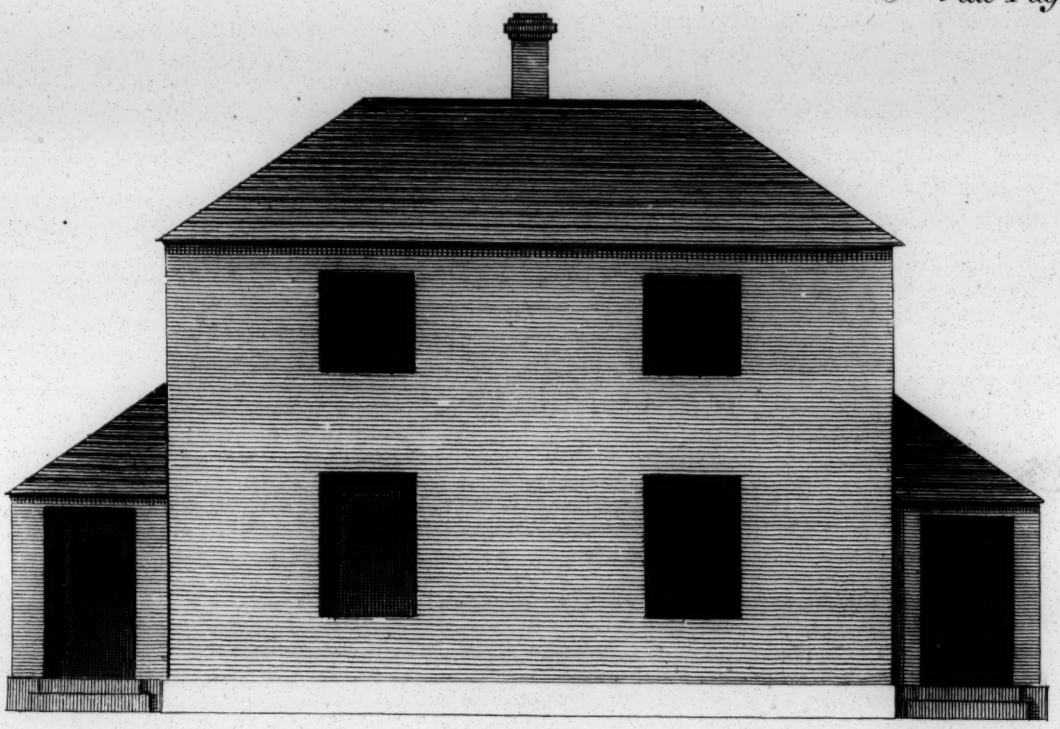
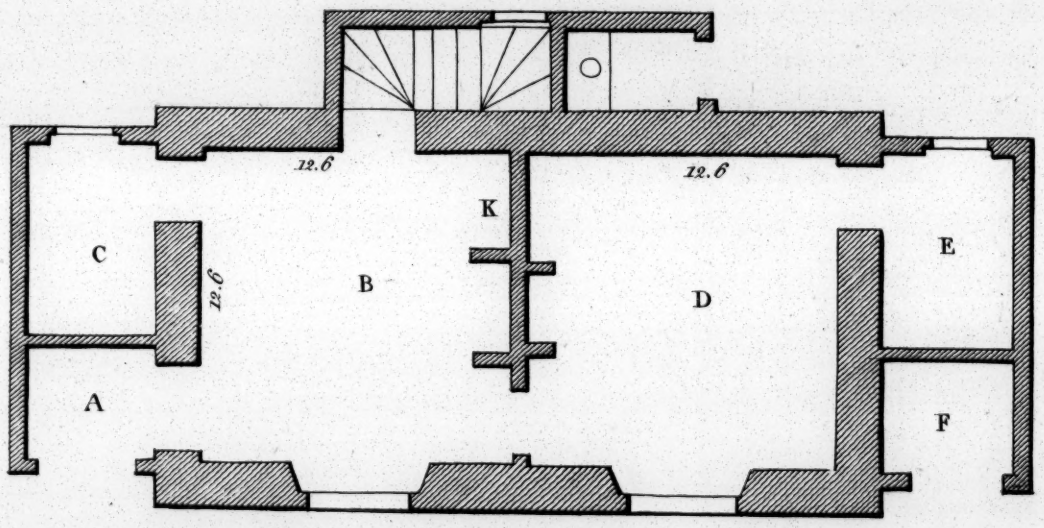
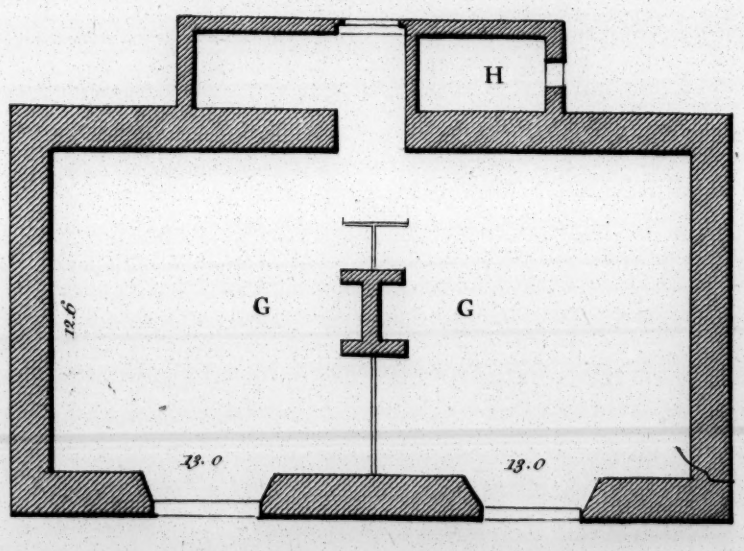
Small Farm Houses, First Class.

Vide Page 49.







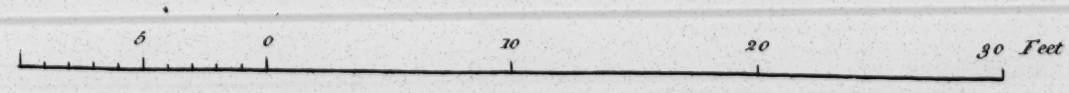


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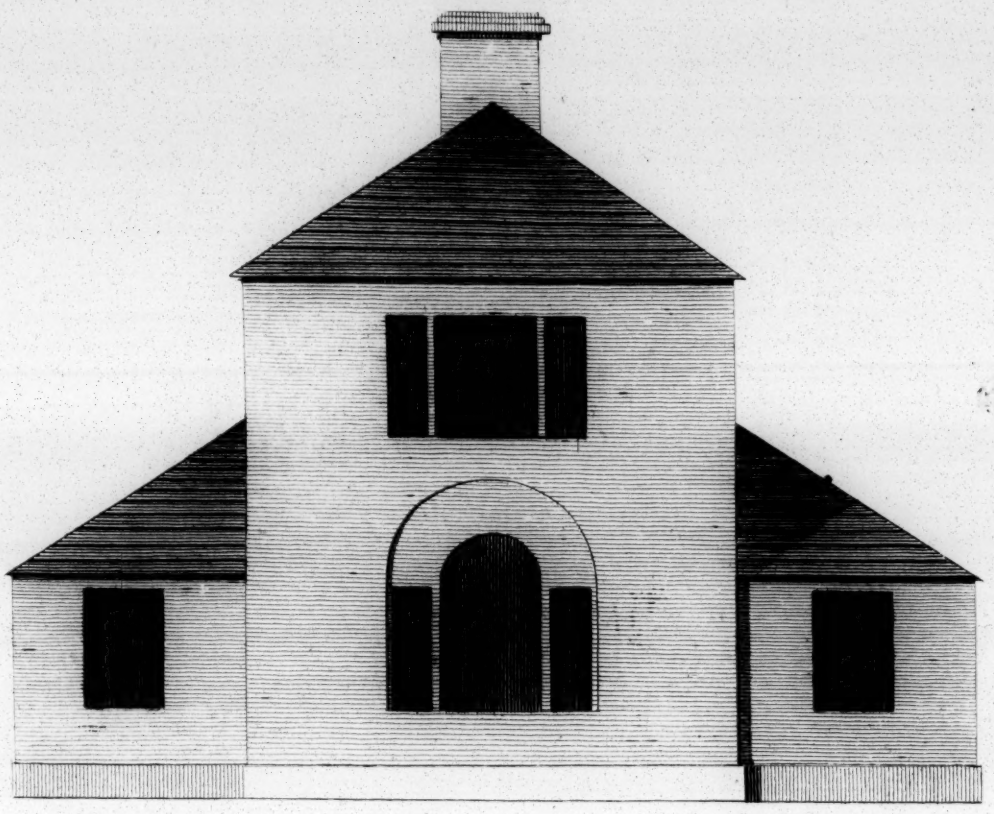
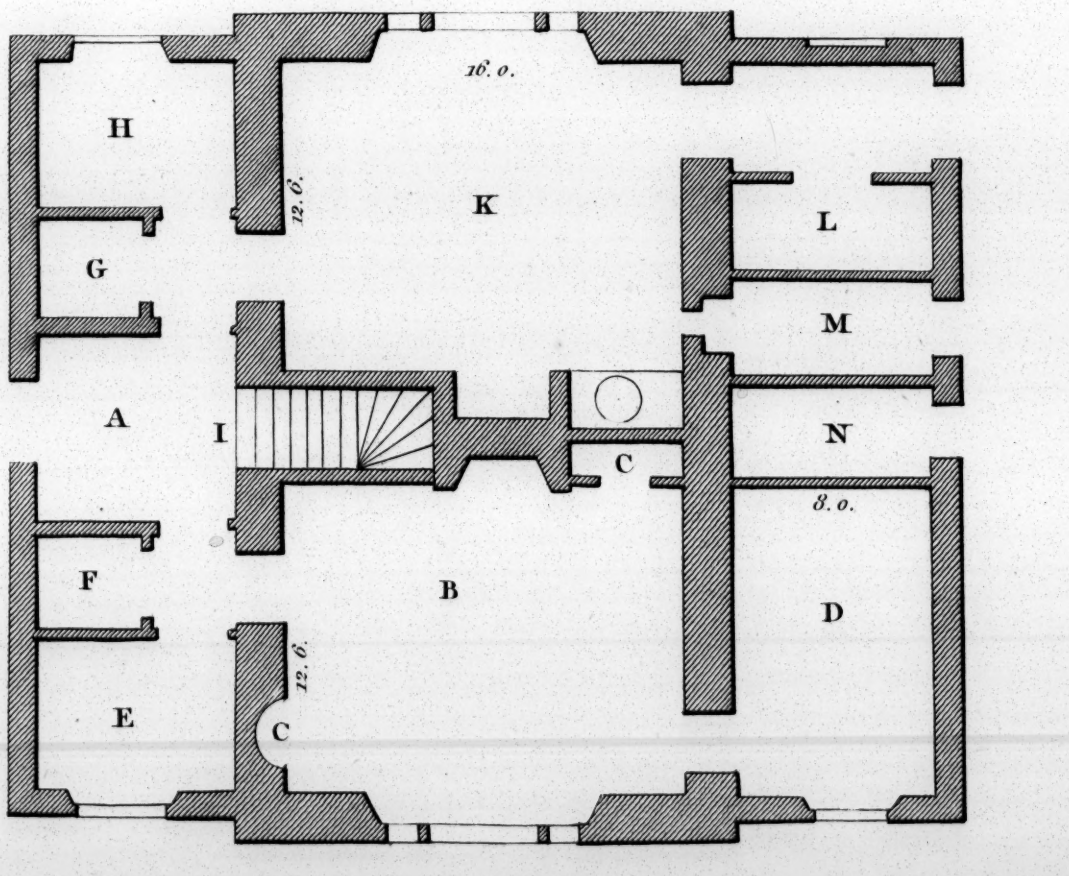
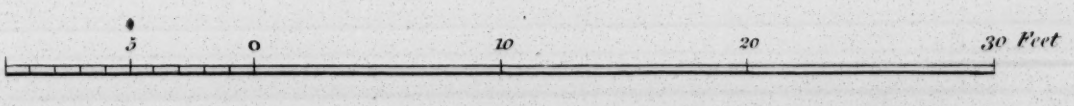
Plate II.

Farm House 2. Second Class.

Vide Page 49.







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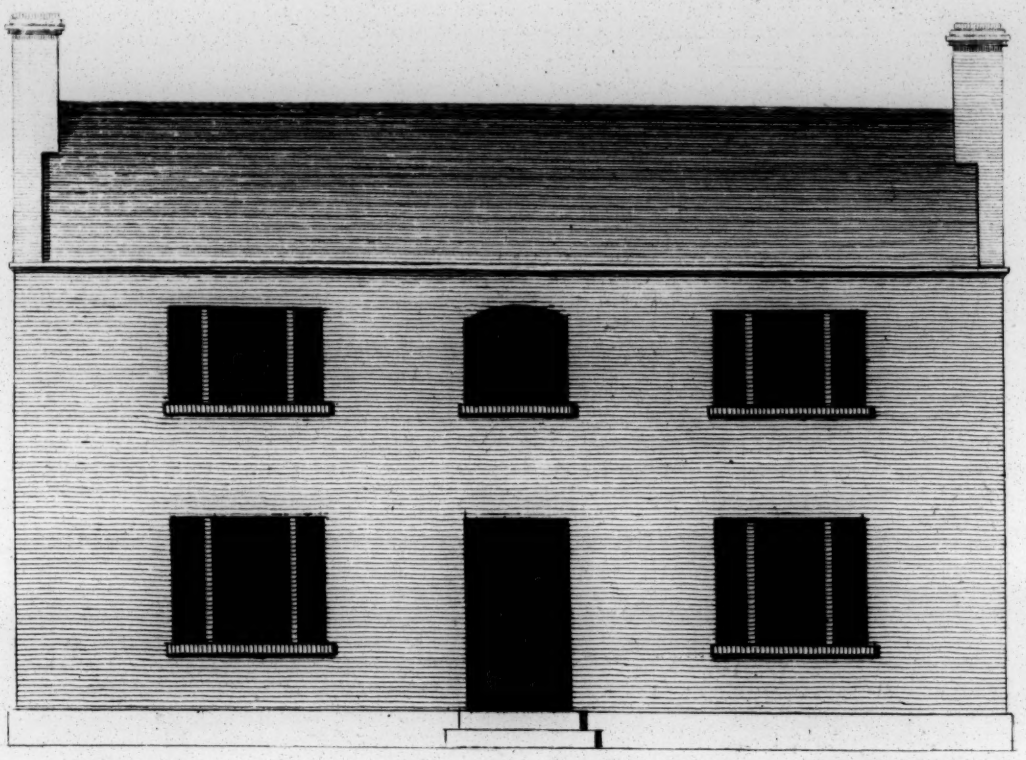
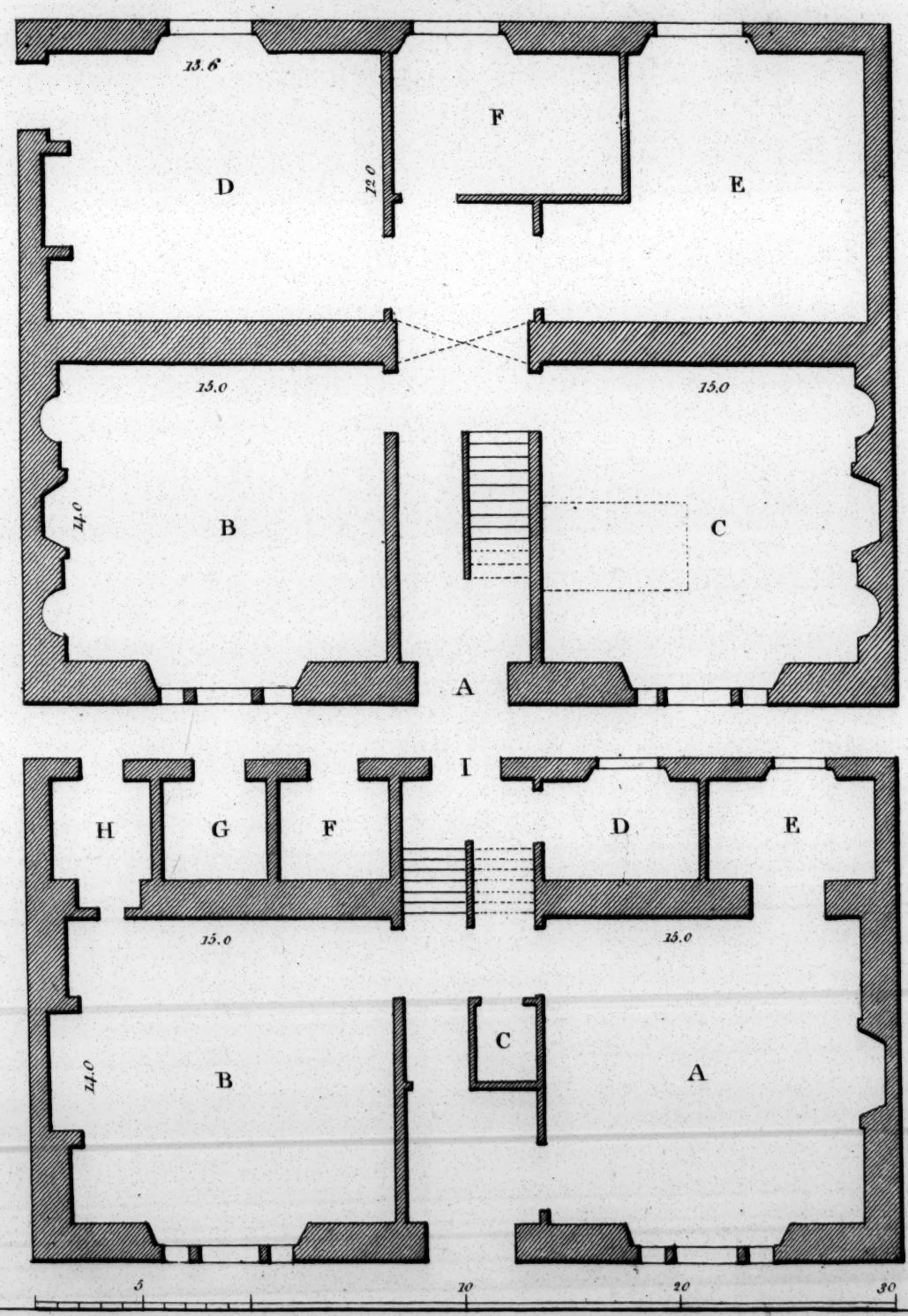
Farm Houses, Third Class.

Vide Page 49.





Ground Plan N.º 1

Ground Plan N.º 2

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FARM BUILDINGS.

EXPLANATION OF THE PLATES.

PLATE I. Contains an elevation and plan of a small farm house, calculated for a farmer who lives with his servants.

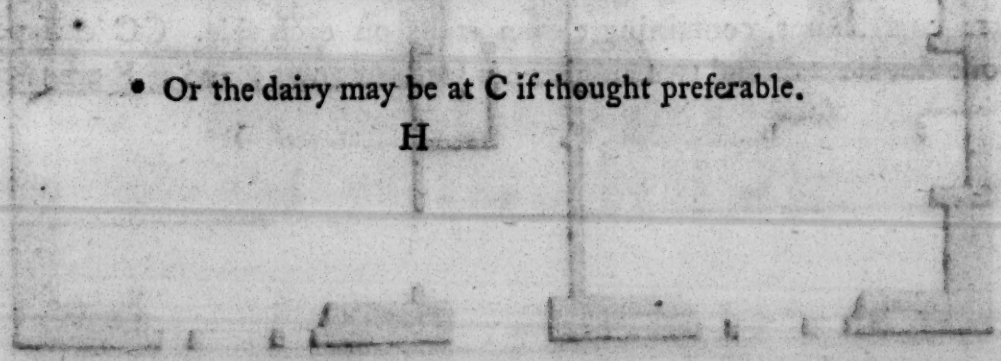
It may be divided as follows:

A is the entry. B the kitchen, having an oven at K if required. C a small apartment off the kitchen, in which may be a bed, or it may serve for a store-room, &c. D the farmer's private room or parlour. E dairy.* F hen-house, or for keeping small implements, as spades, shovels, rakes, &c. GG chamber-floor, containing two bed-rooms. H pigeon-house over the necessary. The dimensions are marked on this and the following plans, but may be varied at pleasure, according to circumstances.

Plate II. Design for a farm house, which if properly executed, would have a very pretty and uncommon effect, especially if built on an eminence, and having a neat garden in front. This house is supposed to be also for a small farm, but larger than the preceding, and for a farmer and his family rather in a better style. It may be divided in the following manner.

A the principal entrance, and lobby. B Parlour. CC closets. D store-room for meal, cheese, &c. E lumber-room, and small implements. F beer cellar. G Pantry. H dairy. I staircase. K kitchen, with an oven under the stairs, and a boiler on the other side of the fire-place. L coals or wood, and back entry. M pig sty, with a small opening towards the kitchen for throwing in dish water, offals, &c. N poultry.

Plate III. Elevation and two ground plans of a farm house, upon a larger scale than either of the two former. Plan No. 1. is divided as follows: A principal entry. B parlour. C family bed-room. D kitchen. E dairy. F pantry and cellar. The three latter are attached to the back part of the house by a continuation downwards of the same roof. By making their ceilings only seven and a half or eight feet high, some small bed-rooms may be got above them, having a few steps down from the floor of the front rooms, or a few steps up from the first landing place. At Burleigh, a seat of the Earl of Winchelsea, is a very good farm house, built nearly upon this plan. The back door of the kitchen enters into a brew-house and wash-house, the fire place and copper being behind the kitchen vent. Beyond this brew-house is a place for holding firewood, &c. in the back wall of which are openings to feed the swine at. In the kitchen is an oven, and below the grate is a very good contrivance for baking occasionally, but principally used for keeping the servants' meat warm. It consists of a cast iron plate and door like an oven. The chamber floor is divided into two rooms forwards and two small ones backwards.



* Or the dairy may be at C if thought preferable.

Plan No. 2. is another manner of dividing the ground plan. A the parlour. B the kitchen. C closet. D dairy. E pantry. F coal-house. G poultry-house. H Pig sty, having an opening to the kitchen. I Back entry. The chamber floor may be divided into two very good bed-rooms, and a light closet to hold a bed also if necessary.

Plate IV. Is a farm house which may be made suitable to a farm of any, and may be divided according to either of the two following plans.

Plan No. 1. A front entry. B best parlour. C common parlour. D lobby and stairs. E kitchen. F pantry. G dairy. H cellar. I back entry.

Plan No. 2. A front entry. B parlour. C kitchen. D back entry under the stair. E brew-house. F cellar. G pantry. H dairy. I door of brew-house and back entry.

The accommodations in the back part of this house are supposed to be obtained in the same manner as in plan No. 1. of the preceding plate, and also the bed-rooms on the chamber floor.

This mode of enlarging a house saves a considerable deal of expence, and does not require so high nor so weighty a roof, as if the back walls were carried up to the same height as the other walls.

A variety of different elevations might be given, to suit the same plans, and many different plans, to suit the same elevations. Several other conveniences might also have been given, but where these are omitted it is supposed they are detached from the house, consequently could not be here included.

It is, however, presumed these four examples will afford sufficient *data* for the construction of farm houses suitable to farms of any description.

Plate V. fig. 1. is an oblong rick, showing the manner of laying the sheaves.

Fig. 2. Is an elevation, and fig. 3. a plan, of a small barn, according to the common construction used in most parts of England for the smallest farms. *abcd* is the thrashing floor. *ab* is a cross wall about three feet high, sometimes built to keep the thrashed corn from mixing with the unthrashed. *e* is a place for putting the thrashed corn out of the way till the whole is thrashed, or time had to clean it and put it elsewhere. This place is also about three feet high, and covered over with boards, but open on the side next the thrashing floor.

Plate VI. Is an elevation and plan of a barn, with two thrashing floors A and B. There is sometimes a cross wall built at the dotted line C. Barns of this kind are often erected of a large size and at a great expence, and yet have seldom any sort of conveniences whatever for storing the corn after it is thrashed, or for any other purpose except piling it up in the straw.

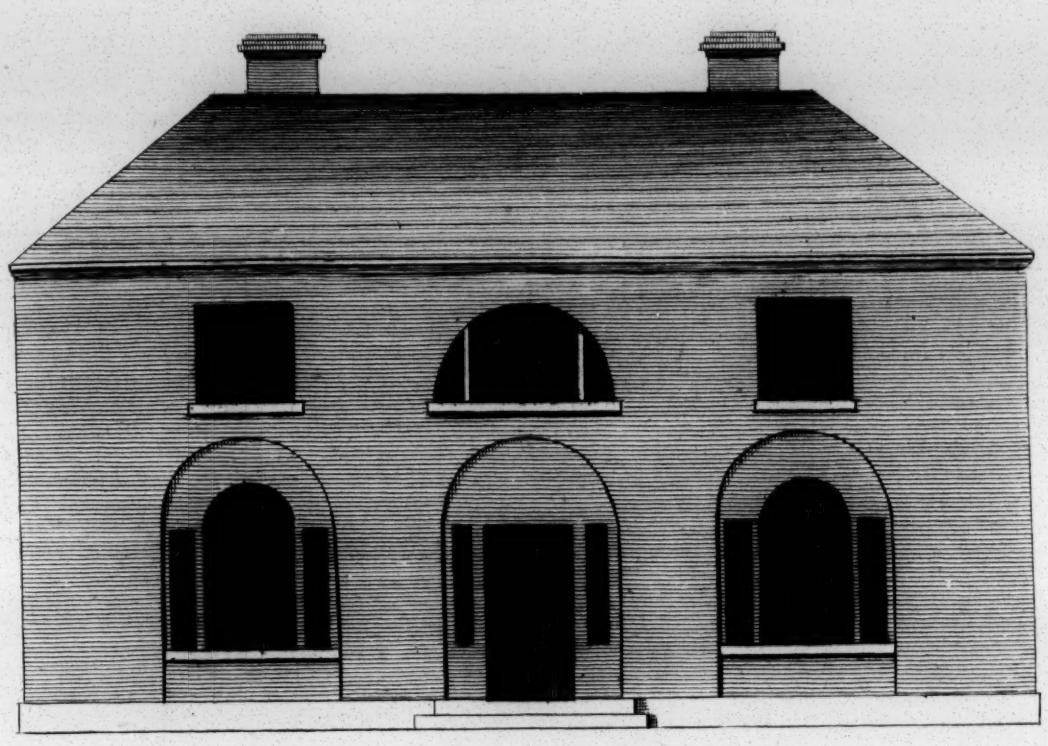
Plate VII. An elevation and plan of a barn at Muncaster, a seat of Lord Muncaster's. The dimensions are perhaps not precisely as his lordship's, for some of them were not measured, but the design is similar thereto. A is the thrashing floor. B place for laying the thrashed corn. C stairs up to a small granary, under which is a place for keeping potatoes, &c. At the other end of the barn is also a division D, which may be appropriated to different uses, as keeping implements, rearing calves, &c.

Plate VIII. A large barn belonging to Mr. Baillie of Hope, near Manchester. A thrashing floor. BB are cow-houses, containing eleven stalls on each side. CC calf-pens, the floors sparred. D one double stall and two single ones for four cows; and at E are two stalls. F is a

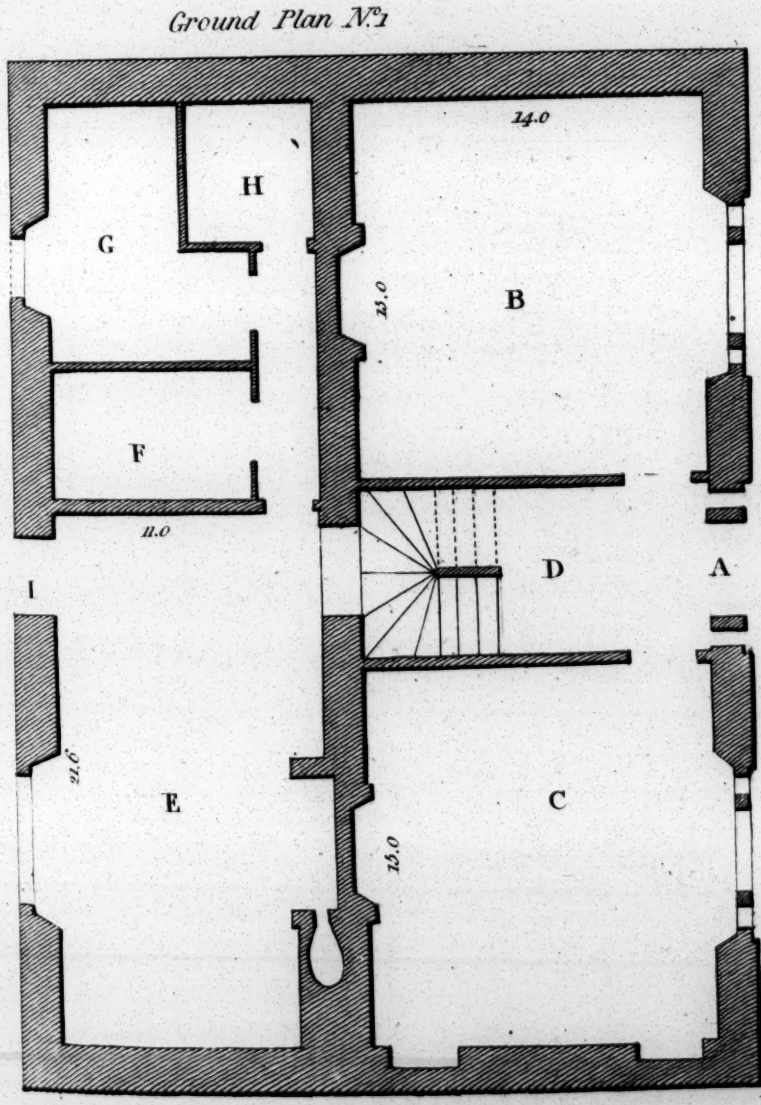
Plate IV.

Farm House, Fourth Class.

Vide Page 50.



Ground Plan N.o 1



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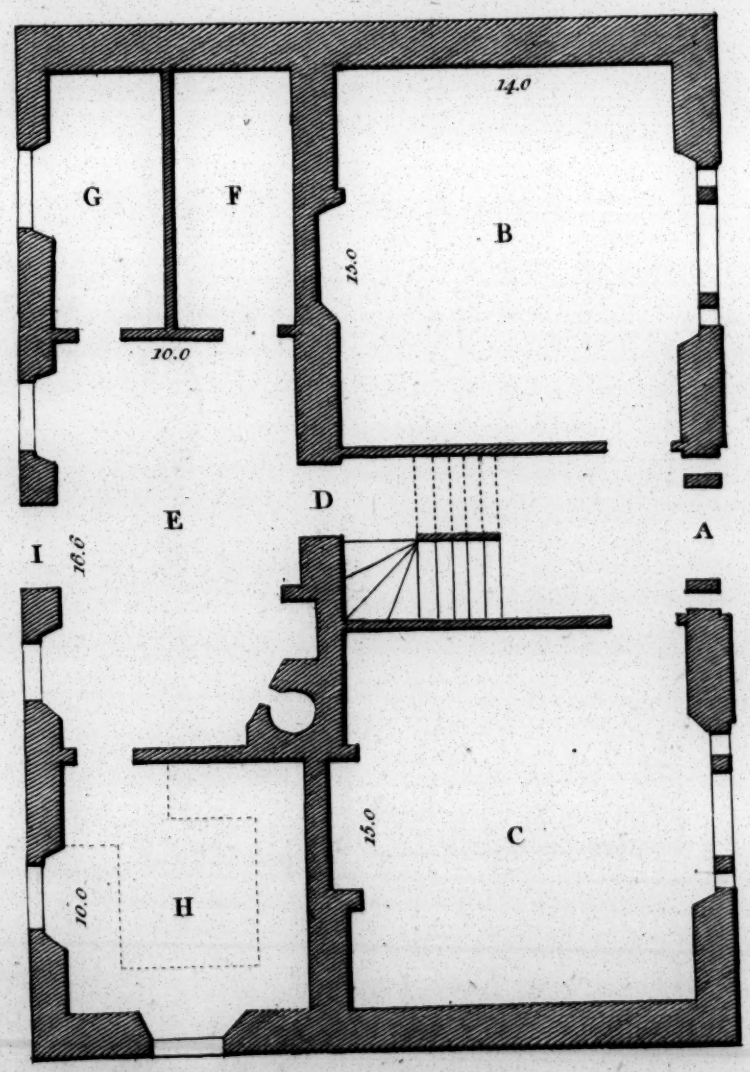

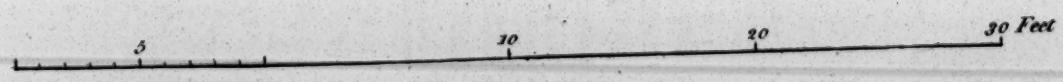

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Plate V.

Small English Barn.

Vide Page 50.

Fig: 2

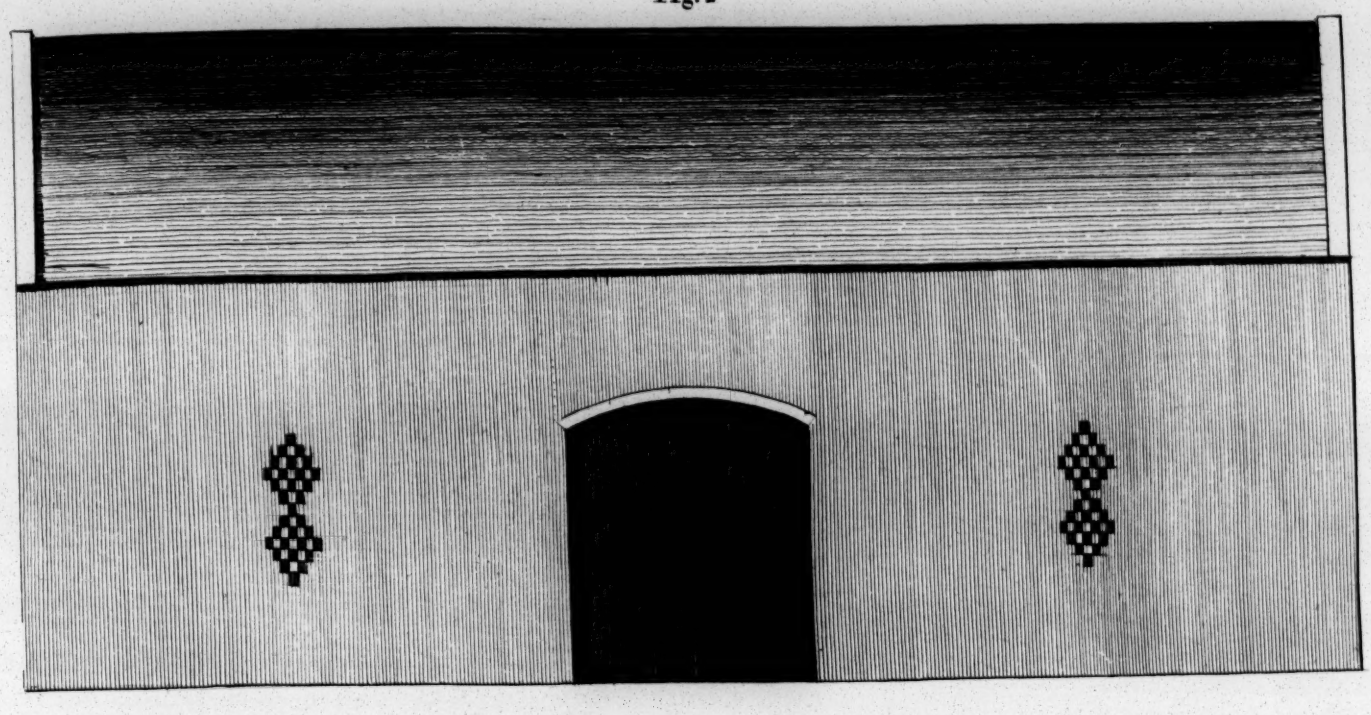
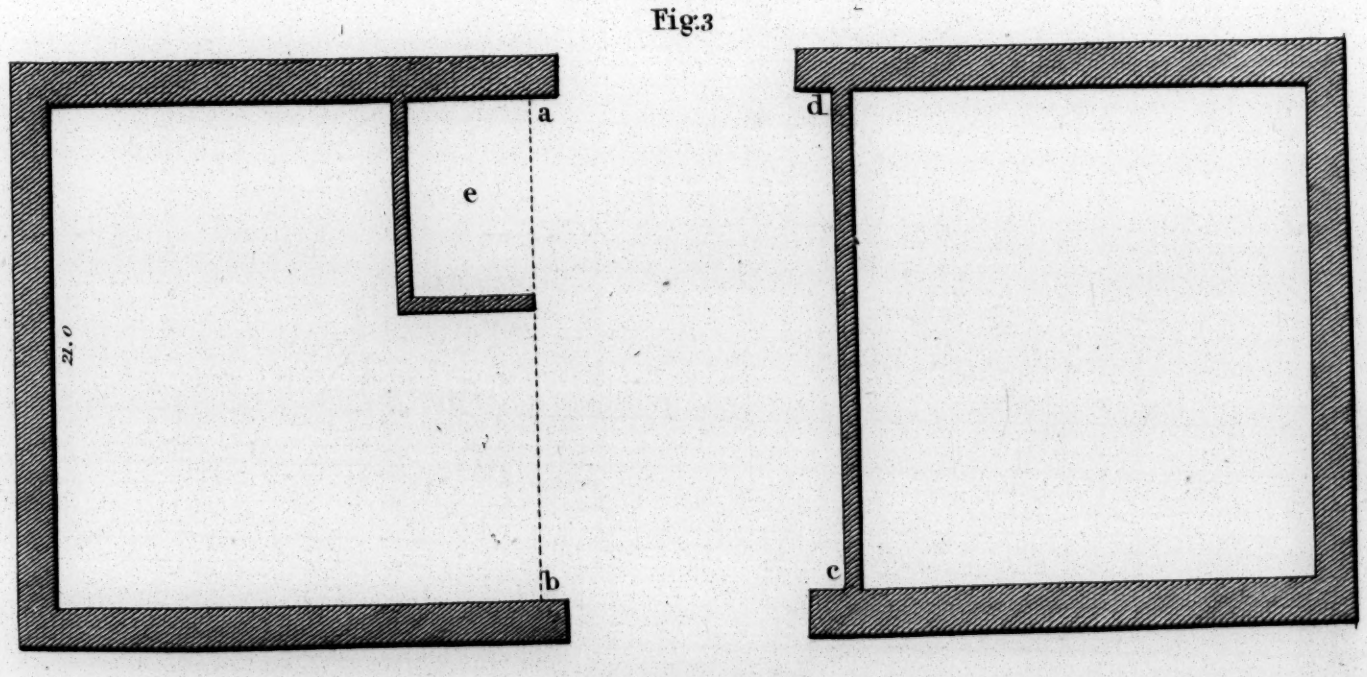


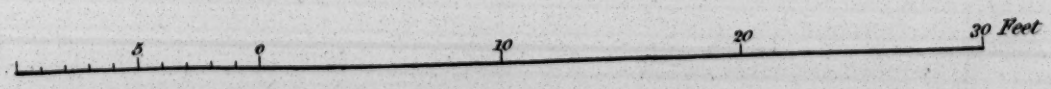
Fig.3



Oblong Rick.

Page 10.

Fig. 1



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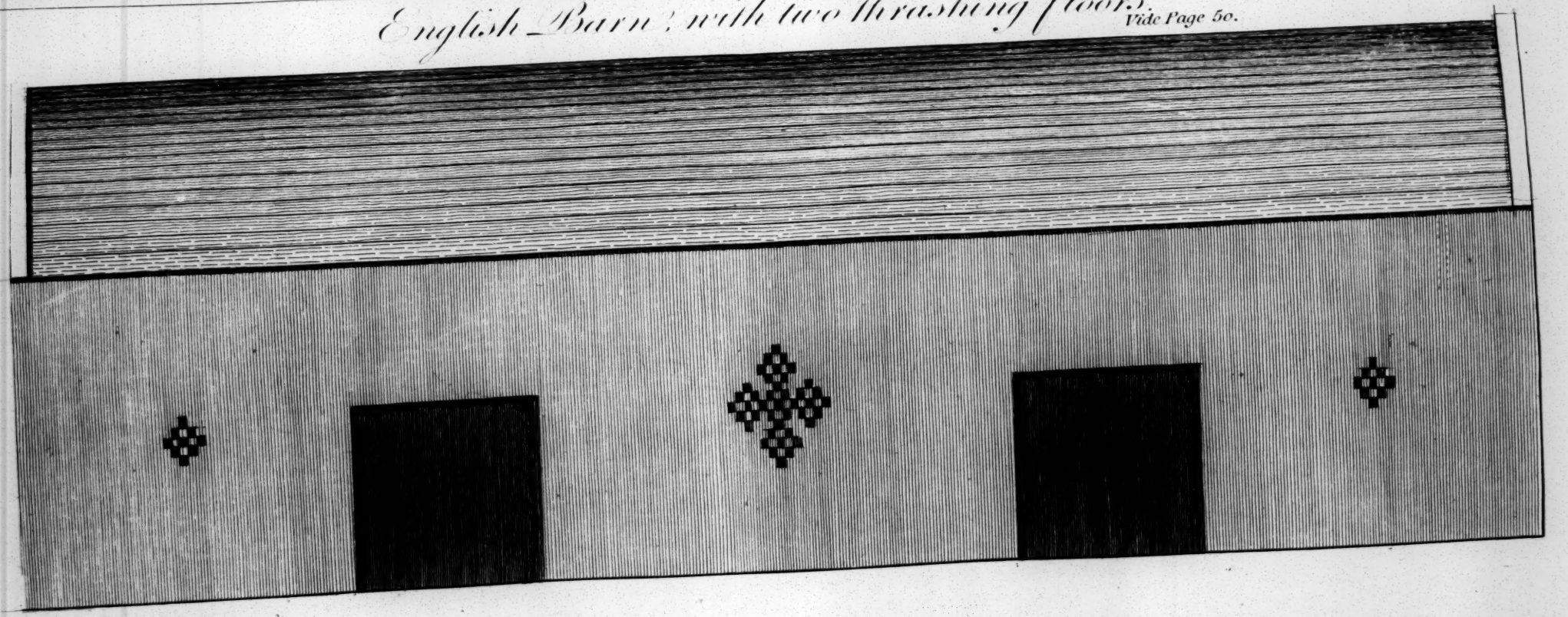
English Barn; with two threshing floors.

Vide Page 50.



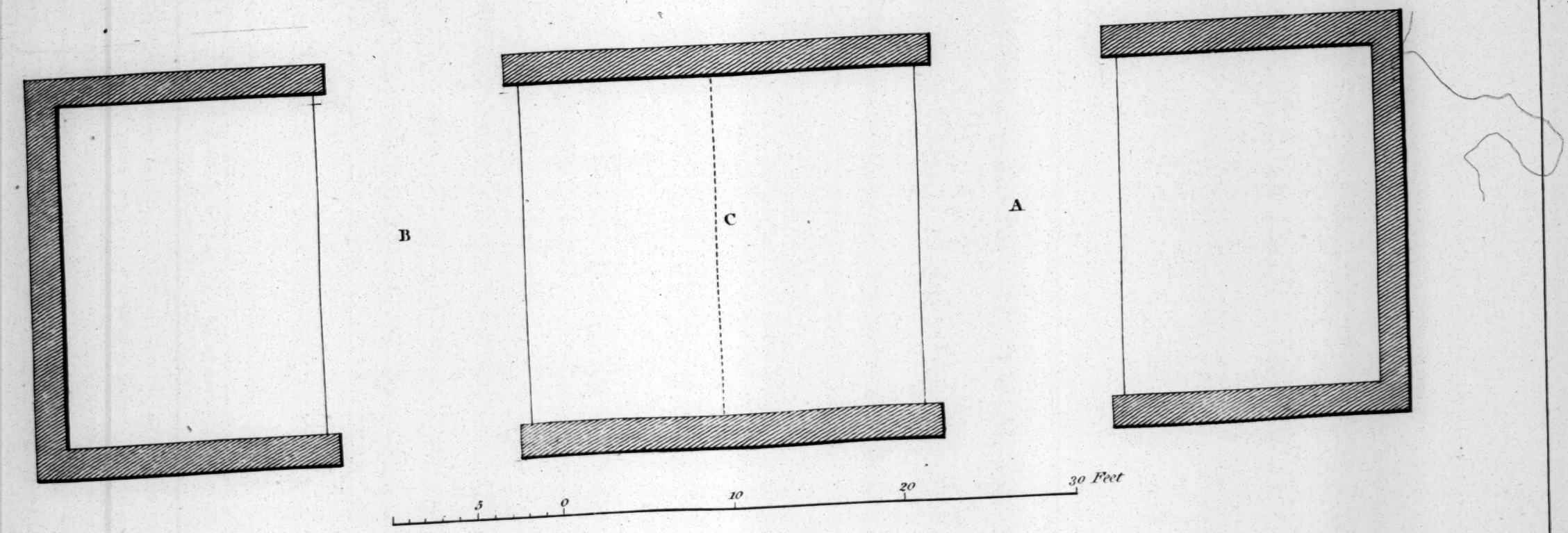


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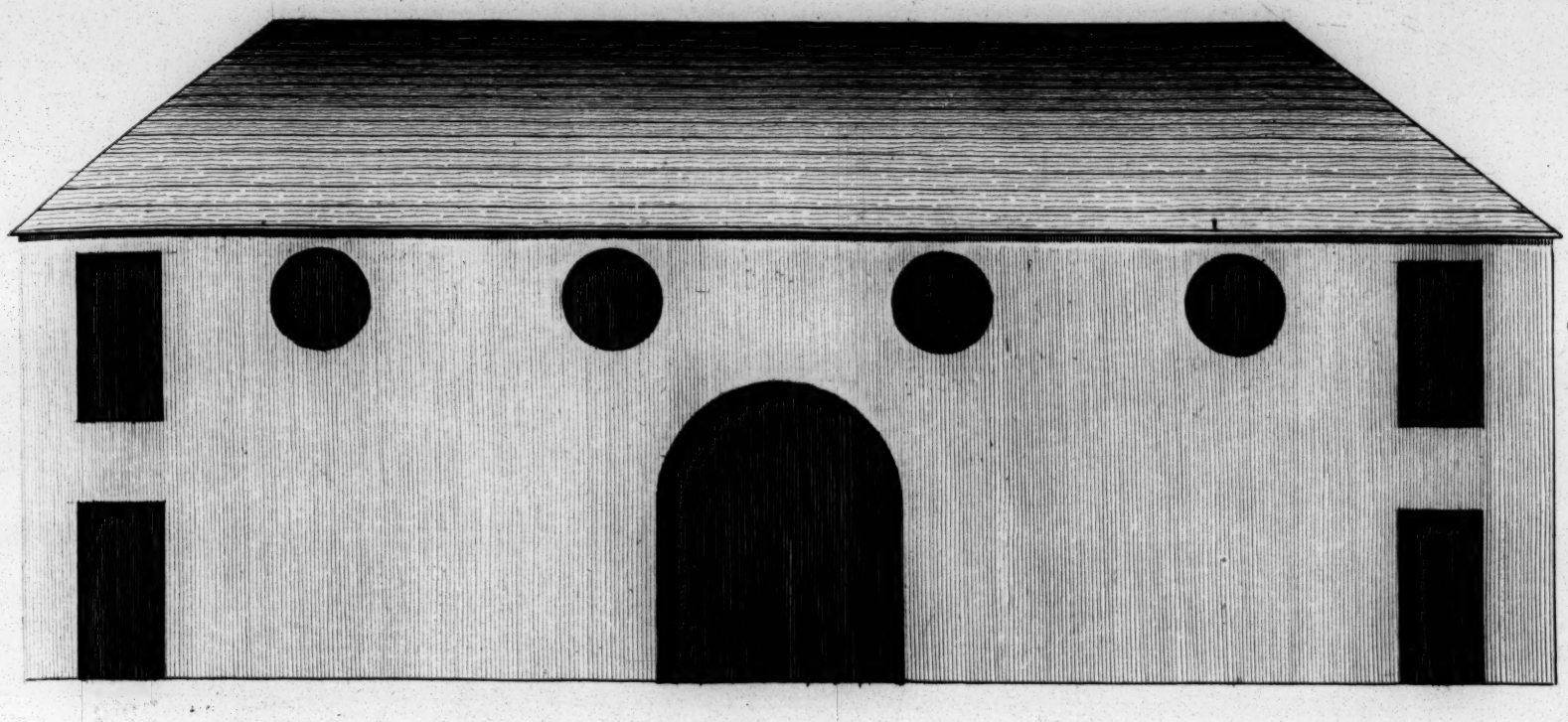
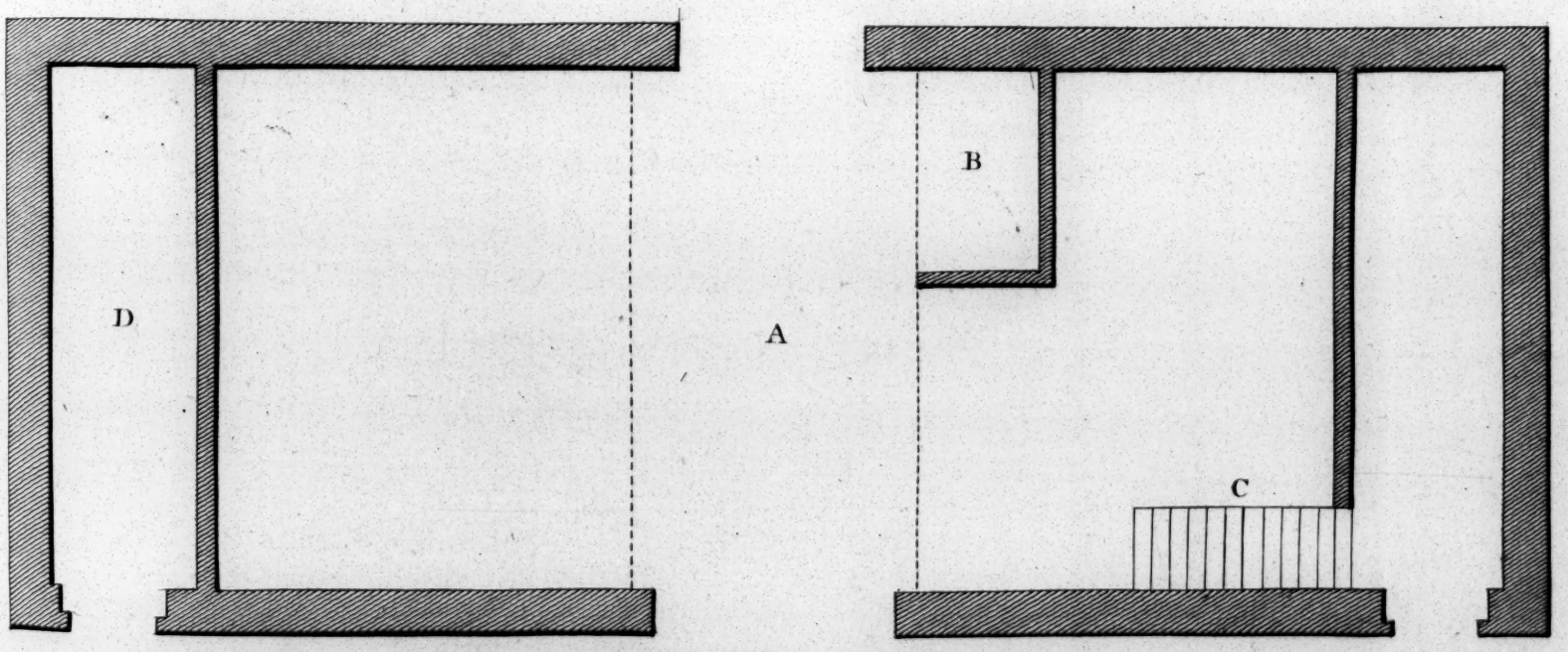
Plate VII

Barn at Lord Muncaster's in Cumberland.

Vide Page 50.





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Communicated to the Board of Agriculture and Internal Improvement.

Plate XIII

Large Barn at Mr Bayley's of Hope near Manchester.

Vide Pages 50 & 51.

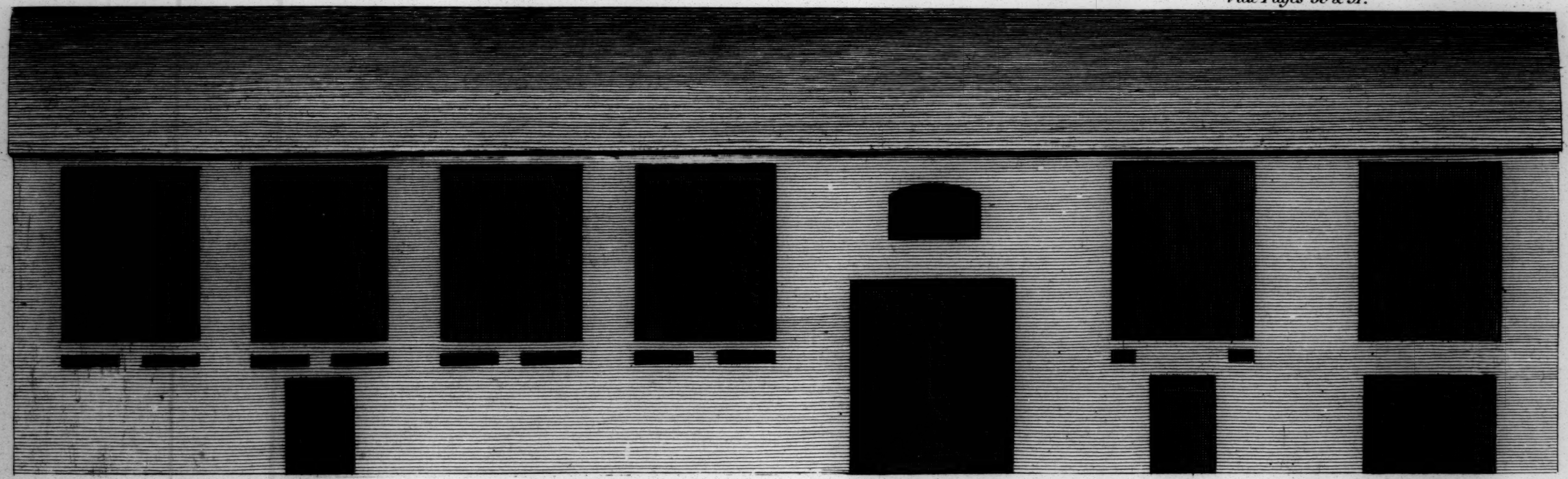

Fig. 2

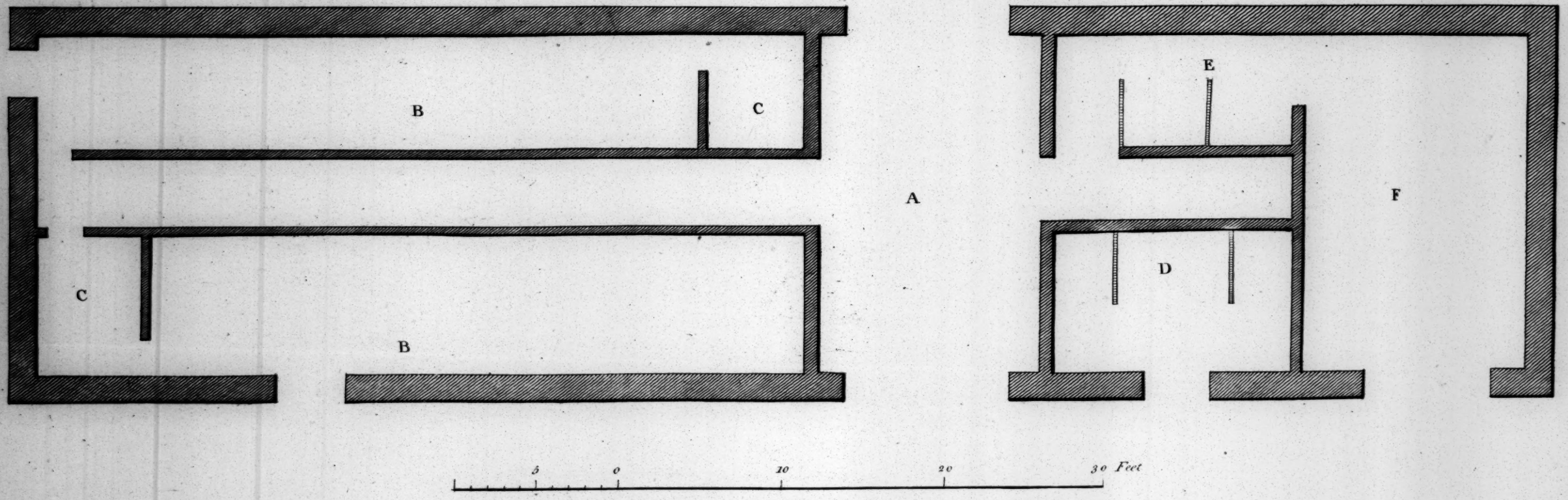

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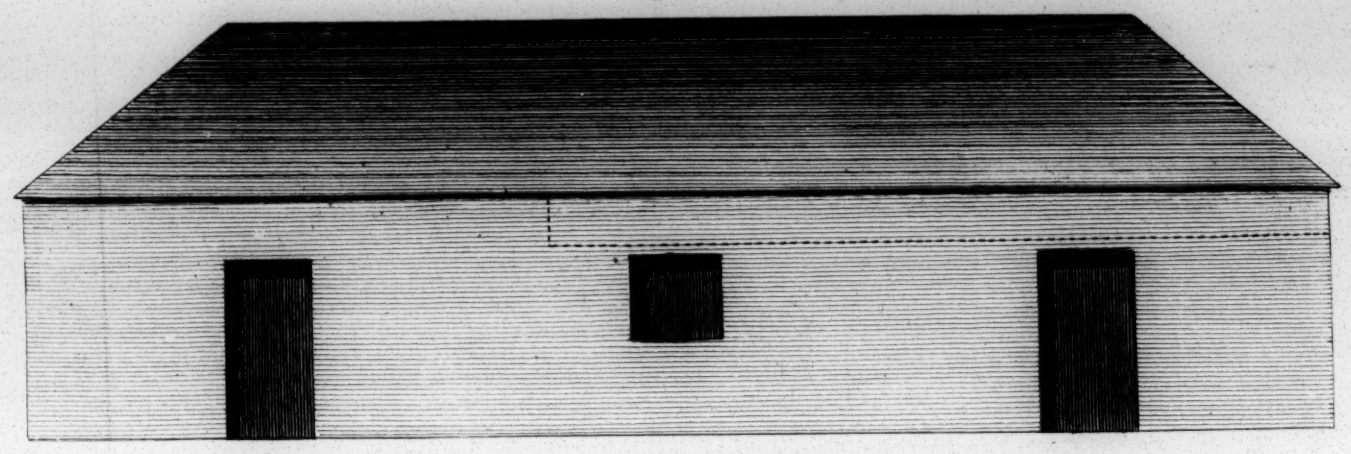
Plate IX.

Design for a Barn & small Thrashing Mill.

Vide Page 51.

Fig.1



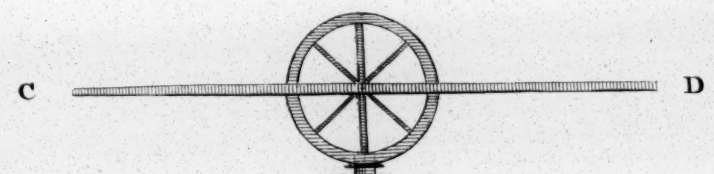


Fig. 2

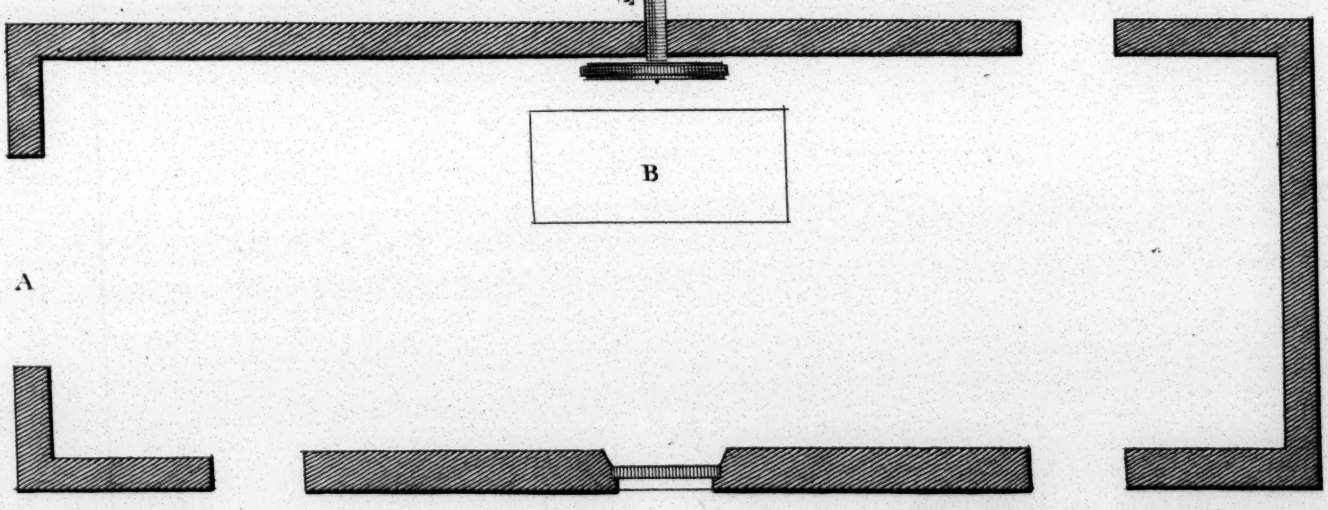


Fig.3

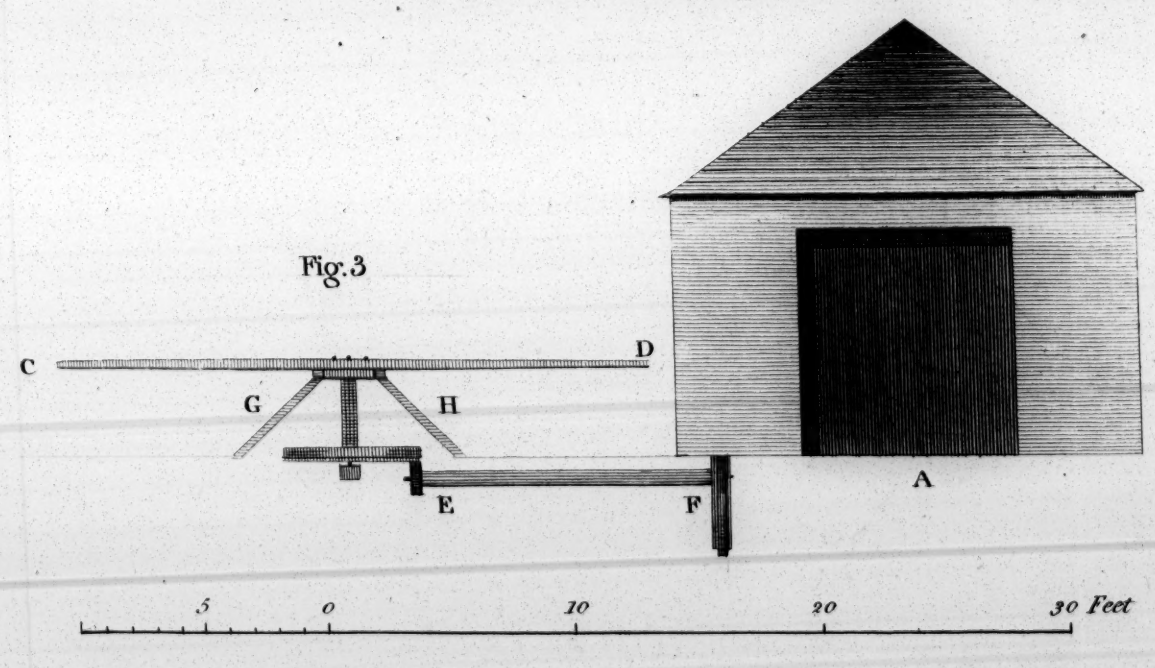


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Plate X.

Design for a Barn, Granary & powerful Thrashing Mill.

Vide Pages 51 & 52.

Fig.1

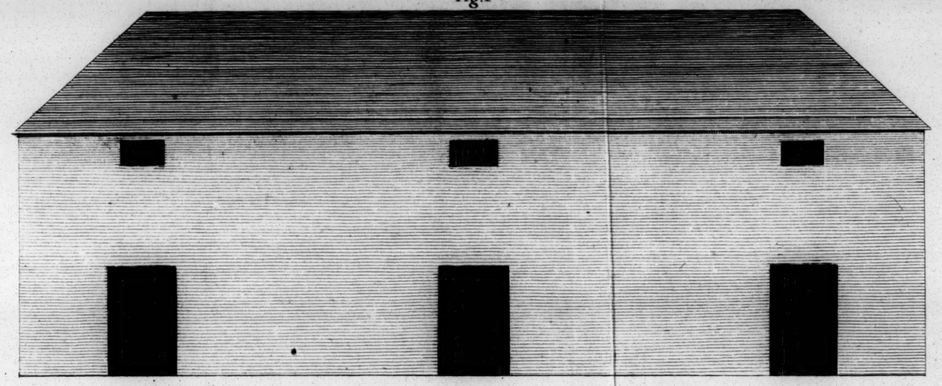


Fig.2

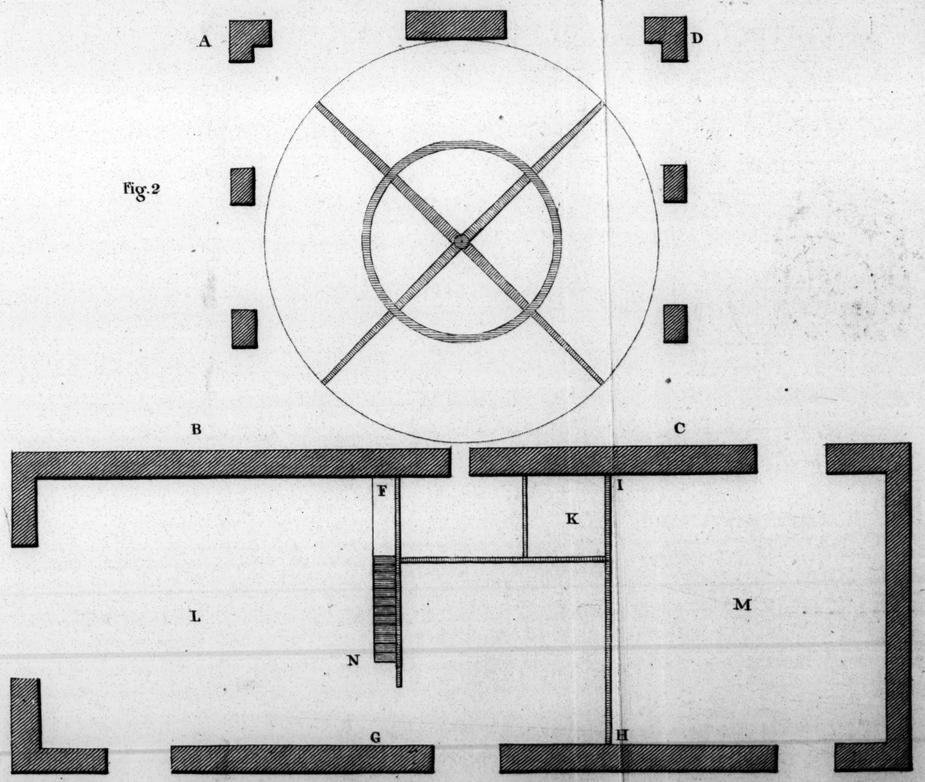
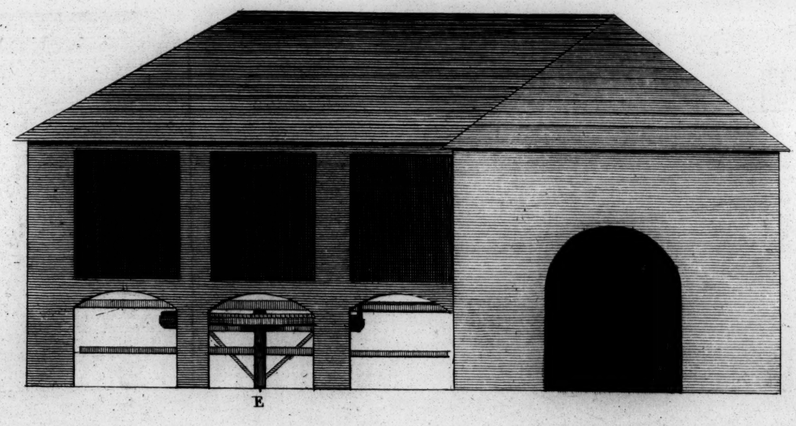
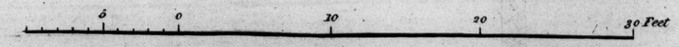


Fig.3





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workshop, root-house, or for keeping implements. Over these the corn is kept in the straw till thrashed. This building contains a great many conveniences under one roof, and although expensive, a good deal of masonry is saved by the large openings in the upper part, which also serve for admitting air to pass through.

Plate IX. Is a front and end elevation and plan of a small barn for a two-horse thrashing mill. This barn is only 50 feet in length within walls, and 16 feet wide.

The walls 10 feet high, which will admit a granary or loft 30 feet long above the thrashing mill, as represented by the dotted line in the elevation, denoting the extent of the granary and height of the floor from the ground. This floor is not carried the whole length of the barn, that there may be the more room in the one end for containing the corn before it is thrashed, which is taken in at the large door A in fig. 2. and 3. At B, fig. 2. is shown the space occupied by the thrashing mill, within the barn, being only ten feet by seven, including the distance from the wall. CD, fig. 2. and 3. is the horse beam or lever 24 feet long, with which the motion is communicated by a laying shaft EF through the wall to the thrashing mill within. There is no cover or shed here over the horse-path and parts without the barn, as is usually the case, excepting GH, which is closely boarded, to protect the wheels of the first movement from the weather, a part of one side being hung on hinges, for the purpose of opening, to grease those parts. The expence of such a mill will be from 30 to 40 pounds, according to its strength; but may be executed for less if slightly put together, which ought never to be permitted in any sort of machinery. For a particular description of thrashing mills, see *Implements*.

Plate X. A front and end elevation and plan of a barn and horse thrashing mill, upon a larger scale than the former: the mill being for three or four horses or cattle, and is supposed to clean or winnow the corn at the same time it is thrashing it. It may also be made to hoist it up to the granary above, and to split beans or cut straw if required, and to perform several other operations, as churning, pumping, grinding, &c. This barn and mill may suit a farm of any extent. The shed over the horse-path and first movements is generally made with a conical roof, and for no other use than covering that path: the expence of this roof is considerable, it is therefore proper it should be made to answer other purposes besides. In this design it is made square, as shown in fig. 2. by ABCD; the dotted circle is the horse-path, in the centre of which stands the upright axle at E, fig. 3. Above this, by carrying up the pillars to a proper height, is obtained a very convenient place either for putting corn in the straw till thrashed, or for keeping straw or hay; or it may be made to serve the purpose of a granary. In either case, however, it will be necessary to construct the floor, so as to support the weight upon it without sinking in the middle, as is shown in the Practical Treatise on Rural Improvements. A communication with the barn may be made near the thrashing mill at F in fig. 2. which would afford an easy access to the mill in case of corn being lodged there to be thrashed. The thrashing mill in this barn is erected on a floor about seven or eight feet above the ground floor, to give room for the fanners or winnowing machine below it. This floor may be extended the whole breadth of the barn, and about 15 feet or more towards I, from the back part of the mill at F, by which, and being properly partitioned below, a very necessary and useful division FGHI will be got for containing the clean corn till hoisted up to the granary. The doors of this place may be locked by the farmer if he chooses, to prevent any other person having access to his unmeasured corn,

even while thrashing it. The space at K will contain the chaff blown from the fanners. There is a door through the partition at G to render the communication more easy and expeditious from the part L where the unthrashed corn is laid, as it may be necessary to look frequently below while the mill is going ; there might also be a door in the partition at H, but this is not so necessary, for the farmer can easily see what his servants are about at M where the straw goes, by standing on the thrashing mill floor, to which there should be steps up at N. This thrashing mill may be made also to rake away the straw, and to throw it down to the part M, which will save a person raking from the mill. The expence of this thrashing mill, if made to clean the corn and rake away the straw only (which in general will be found sufficient) will amount to about £50. exclusive of flooring, &c. If made to hoist up the corn, to split peas or beans, and cut straw, from six to ten pounds more for each of these operations; and for other machinery, according to the manner of constructing it.

Plate XI. Contains two elevations, a section and plan of a barn, with a thrashing mill that goes by water, cleans the corn at the same time it is thrashing it, hoists it up into the granary above, grinds it into meal, and makes pot or pearl barley, all by the same water wheel. I erected this barn and these mills in the year 1792, at Kilrie, in Fifeshire, and have found them to answer so extremely well, that besides the advantages of the thrashing mill, the other mills pay near 20 per cent. of the whole original outlay. The thrashing mill has sometimes thrashed and cleaned in the space of one hour, above 12 bolls of oats, which is more than 71 Winchester bushels, and requires six people to attend it while thrashing at this rate. A particular description of all the parts of this mill being given in the work already referred to,* it is unnecessary to detail them here. The following is a general description of it:

Fig. 1. Elevation of the front. The end A is intended to be joined to other offices, as stables, &c. leaving an arch 10 feet wide to admit loaded carts to the barn. 1. a door into the side of the barn, and to the upper part of the mill; 2. door at which the straw is thrown out when thrashed; 3. door into the lower part of the mill; 4. the water hole, through which the water is conveyed in troughs to an overshot water wheel; 5. back spout in which the water runs, when set off the water wheel; 6. windows of the granary.

Fig. 2. Is a longitudinal section, or rather a view of the inside, showing the position of the machinery and manner of working the thrashing mill. AB level of the barn floor. CD level of the lower mill floor. EF level of the upper mill floor. GH granary floor. 1. thrashing mill with hopper and fanners below; 2. person feeding the thrashing mill; 3. person raking away the straw; 4. person handing up the sheaves of corn to the feeder. Besides these it requires one or two to shake the straw, and sometimes if much water on, another person to feed the mill. 5. chaff-hole; 6. water wheel; 7. water troughs; 8. back spout; 9. the corn mill and hopper, &c.; 10. sack tackle for hoisting sacks into the granary; 11. partition of a small writing office in the angle above the water wheel; 12. door into the kiln, which has also a spout from the granary. The barley mill is not represented here, as it would conceal some of the other machinery.

Fig. 3. Is the end elevation. 1. water troughs which conduct the water into the aperture 4, shown in fig. 1.; under these troughs loaded carts, &c. go to or from the mills or barn yard;

* Pract. Treat. on Rur. Imp.

Plate XI

Barn & Granary with Water Thrashing Mill, Corn & Barley Mill &c.ª at Kilrie in Fifeshire.

Vide Pages 52 & 53.

Fig. 1

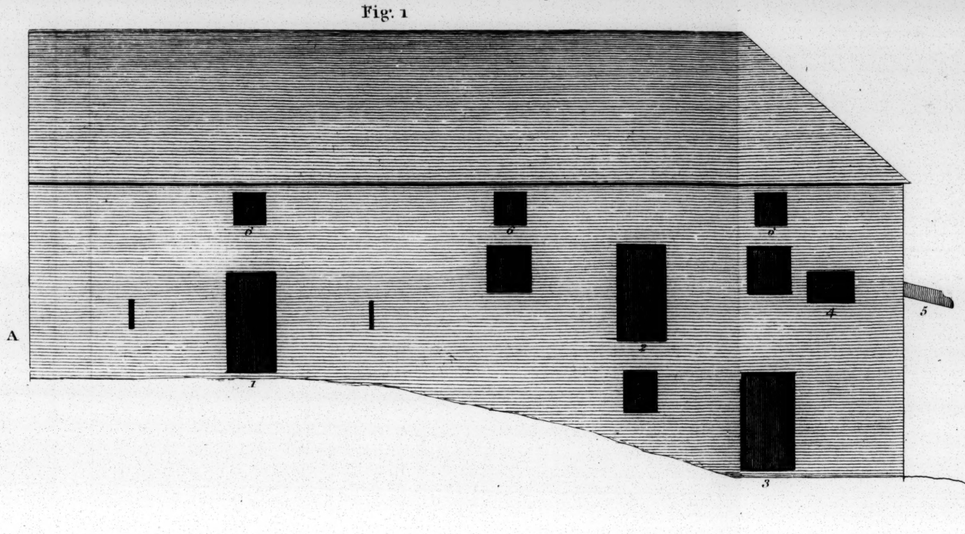

Fig. 3

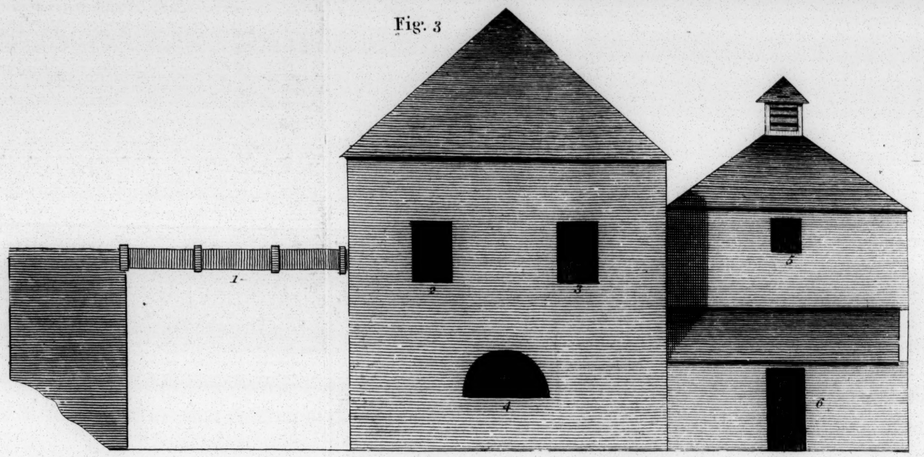

Fig. 2

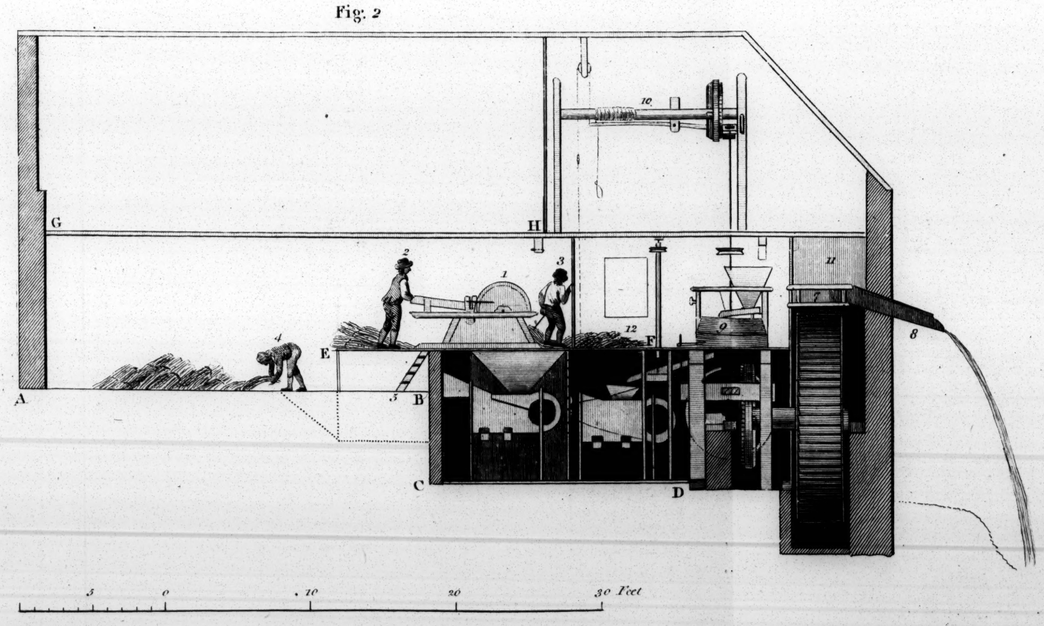

Fig. 4

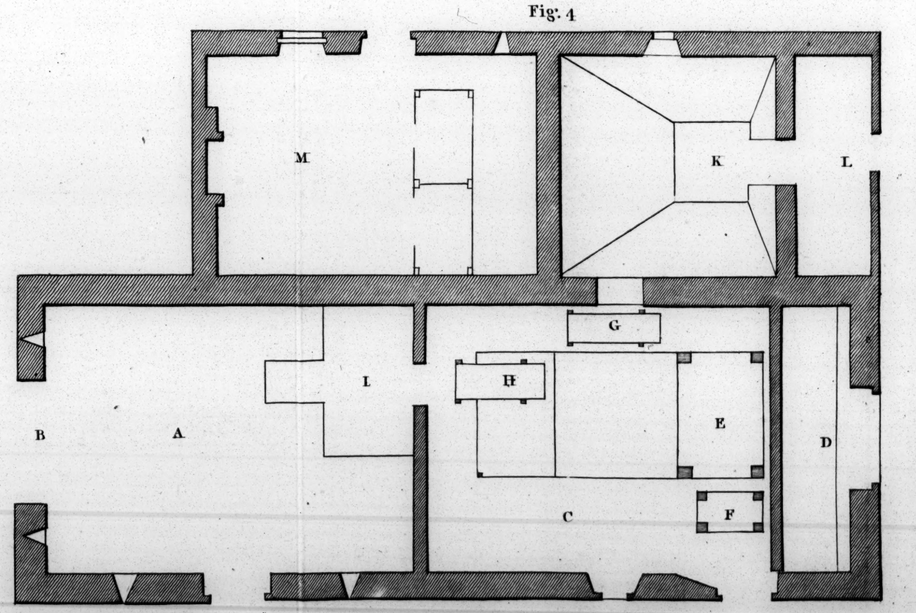

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Plate XII

Curious Granary

Vide Pages 53 & 54.

Fig. 1

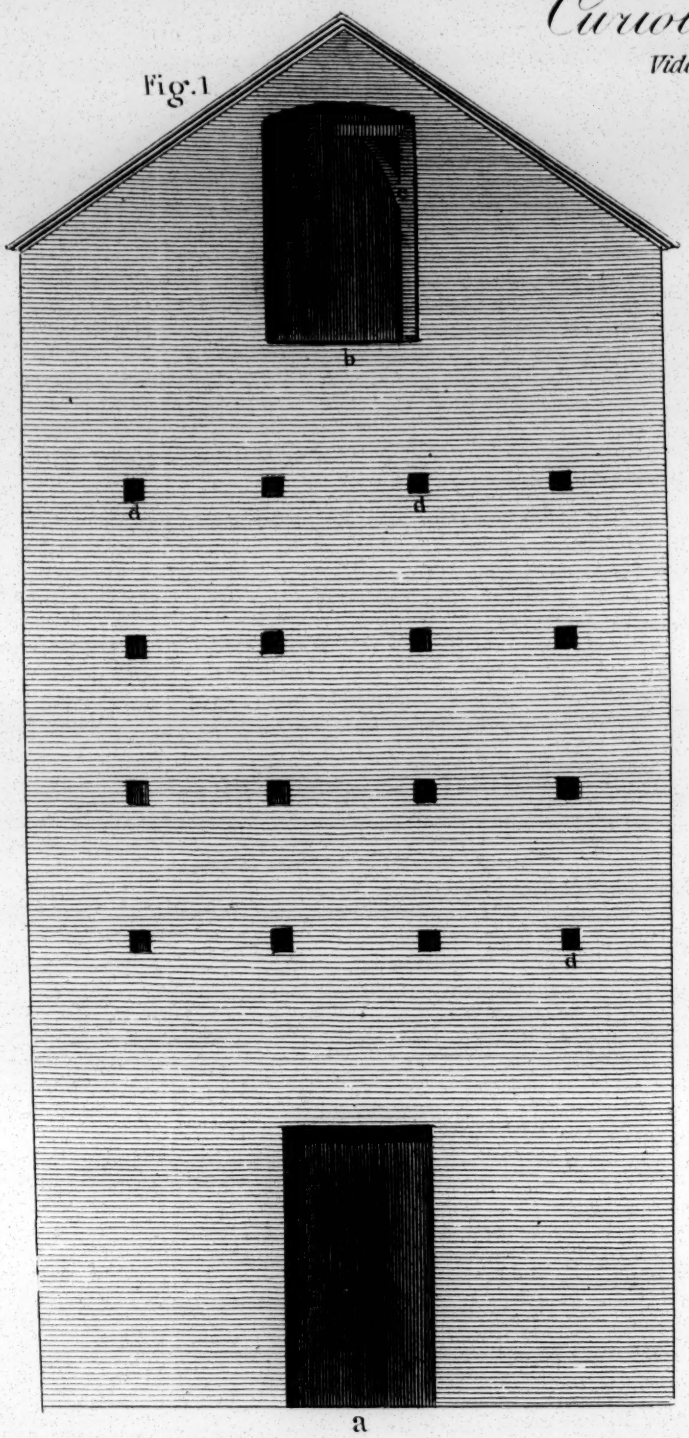


Fig. 2

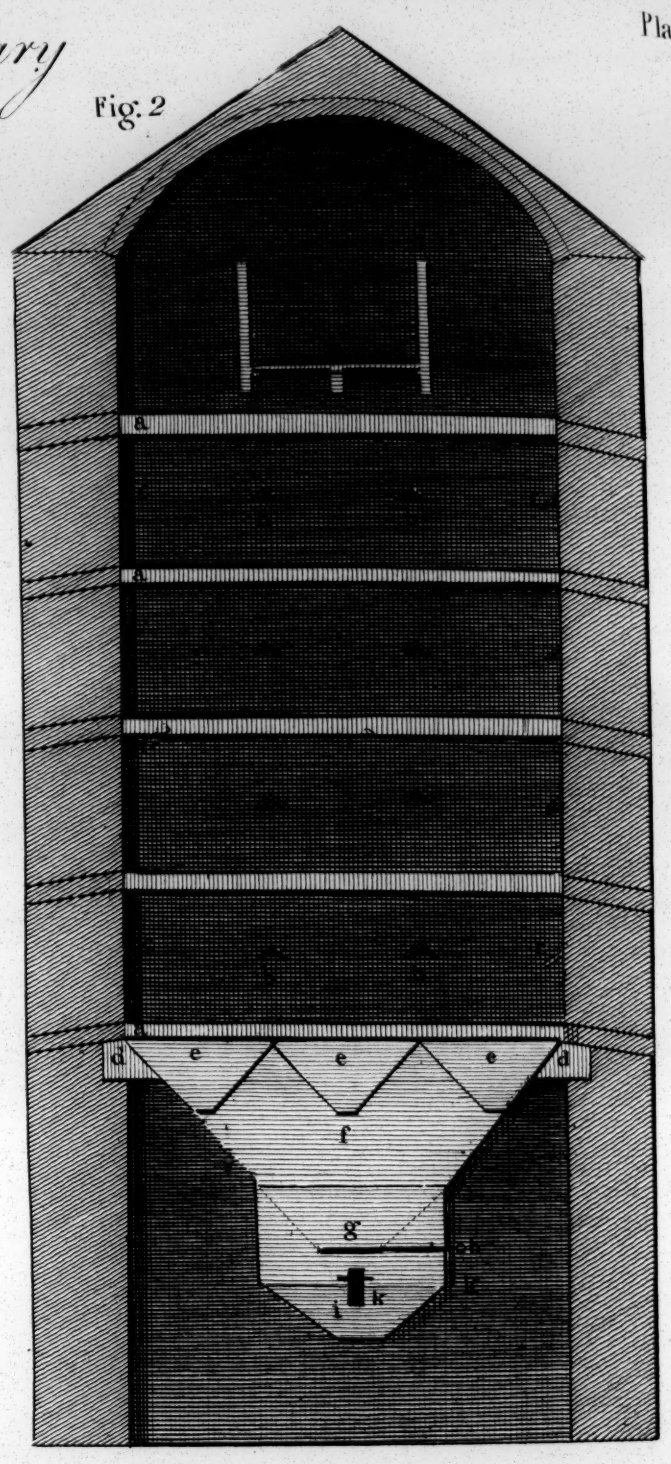


Fig. 3

Fig. 4

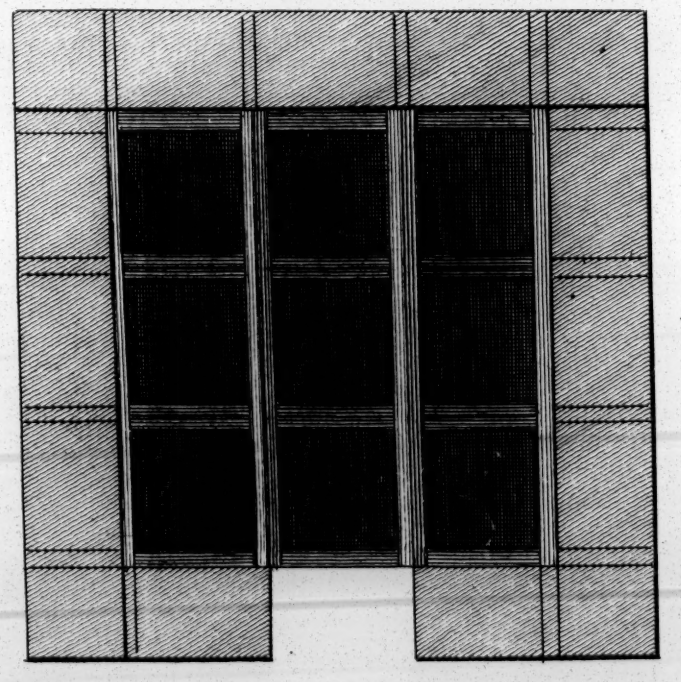
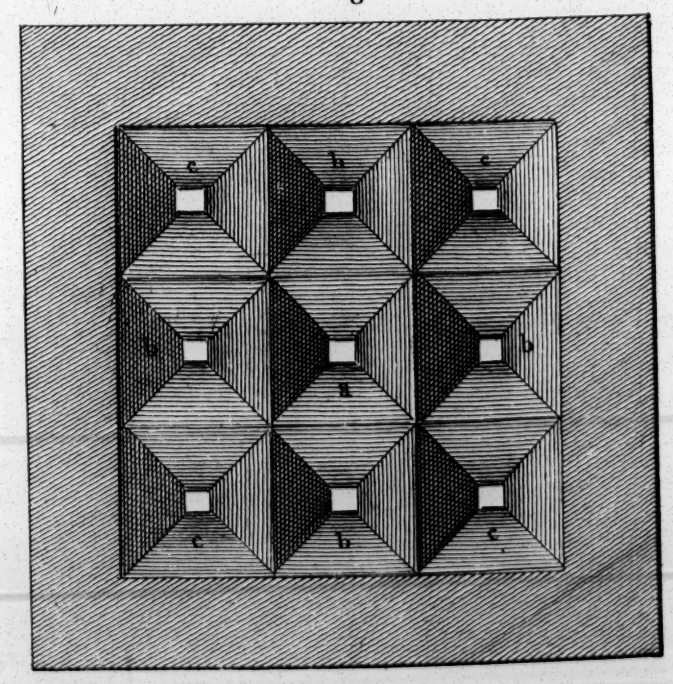


Fig. 5



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2. window (for uniformity's sake), out of which the water comes when let off the wheel, as shown by the spout at 5, fig. 1. and 8, fig. 2.; 3. window of the writing office; 4. opening to the water wheel when necessary to grease the outer gudgeon, or to repair or examine the wheel; 5. kiln for drying corn upon wire cloth; 6. a close shed (in some places called the kiln logie) for keeping dry the fuel when using it, and where the person sits to feed the fire.

Fig. 4. Ground plan. A the barn. B large door which admits a loaded cart into the barn. C lower mill. D water wheel. E herst framing, within which are the pit wheel and the three iron pinions that move all the machinery. F situation of the barley mill. G fanners for cleaning the shelling or oats when the husks are taken off in the first process to prepare them for grinding. H thrashing mill fanners, which blow the chaff backwards into the chaff-hole I. K lower part of the kiln where the fire is put. L kiln logie. M the miller's house.

The whole expence of this building and machinery (which would suit a farm of any size), exclusive of carriages, did not exceed £400. being much less than is often laid out in some places on barns, affording no other convenience than for storing corn in the straw.

Other constructions of barns for thrashing mills might be given, particularly of those for wind, which in some respects is a better mode of working them than by horses. A very excellent mill of this kind is erected at Captainhead in East Lothian, the sails of which are so constructed, that by a very ingenious and neat contrivance they can be furled and unfurled while the mill is going.* But where water can be had, it is by far the best manner of working a thrashing mill.

In most of the large barns now used there would be no difficulty whatever in erecting a thrashing mill, and acquiring every other convenience necessary. The principal thing is to obtain a person intelligent in those matters, who can plan out the building as it ought to be, and afterwards construct the mill properly.

There are many pretenders to this knowledge in various parts of the kingdom, who will undertake to do a great deal more than they are capable of performing.

Owing to these many gentlemen and farmers have been most egregiously imposed upon, and after being at the expence and trouble of erecting a thrashing mill, have neither found it to answer their own expectations, nor to correspond with the promises of the projector.

These very useful and profitable machines are on that account in some places even got into disrepute. If any thing contained in these observations should tend to retrieve their character in such places, or be the means of satisfying farmers in general, and others, of the facility and the astonishing advantages of erecting *proper* thrashing mills even in their present barns, it will afford the most pleasing gratification to think that this work (in some respects at least) is likely to answer the purpose for which it is intended—to promote the public good.

Plate XII. fig. 1. Front elevation; *a* door into the lower part. *b* door into the loft, to ascend to which a ladder is necessary; *c* a crane for hoisting sacks from below; *ddd*, &c. air-holes.

Fig. 2. Section or view of the inside; *aaaaa* are wooden spouts which reach from the air-holes on one side of the granary to those on the opposite side. These spouts are made of inch-deal, about six inches broad, and formed with an angle similar to those spouts that are sometimes

* See Pract. Treat. on Rur. Imp.

used to carry off the rain water that drops from the easings of the houses. They are laid across the granary, with the angle uppermost, as shewn in fig. 3.* *bbb*, &c. are the ends of similar spouts, which cross the other ones, and reach also, betwixt the air holes on the other two sides of the granary, as shown in fig. 4. *ccc*, &c. are half spouts, extending in the same manner to air-holes on each side. The air-holes must have a declivity outwards to prevent rain or snow beating in; and should likewise be secured with wire-cloth, to keep out insects or other vermin. *dd* is the floor of the granary, which is three yards square, and divided each way into three hoppers; *eee* of one square yard each, making in all nine hoppers, as shown by fig. 5.; *f* is a large hopper which encompasses all the rest, and has a slider at *g*, for opening occasionally when any grain is to be taken out.

There is also another smaller hopper *i* suspended to this by four iron hasps *kk*, &c. which may be easily unfastened, if required, from the square deal box *oo*, fixed to the large hopper. Through the side of this box, the handle *h* of the slider must extend. This hopper is chiefly used for the convenience of taking out a small quantity, but is removed when a large quantity is to be taken out of the granary: *m* is a small loft where the sacks of grain are hoisted up and emptied over the sides or rails *nn*, from which it falls down, passes through the hopper, *ee*, till *f* is filled, (the slider *g* being closed); and as the corn is continued to be emptied from the loft, so the granary continues to fill, till up to the top, if required.

The spouts being all inverted, as already mentioned, and open below, it is clear that, although the granary is filled to the top, the corn will not, like a fluid, rise within the spouts, above the level of their lower edges; and thus there will be a vacuum left within every spout, through which the air will freely pass. These spouts are placed three feet distant from each other horizontally, from angle to angle, and eighteen inches vertically; that is, from those in one tier to those of the next tier which crosses it.

The holes in the bottoms of the hoppers *eee*, &c. should be so proportioned that one may not give vent to the grain faster than another; for which reason the aperture of the middle one *a*, fig. 5. should be the smallest, because there there is the least obstruction. The apertures *bbbb* should be somewhat larger, as the grain will meet with some little obstruction there, by the sides of the large hopper; and the apertures *cccc* should be the largest, as the obstruction in the angles will be greater than in any other part.

On viewing this granary, it is evident that, if filled with corn, and the slider *g* opened, the whole mass will be moved as the corn falls out, consequently that a new surface will successively be exposed to the air that passes through the air holes and wooden spouts; and thus by taking out a few bushels, perhaps, at *g*, the whole grain will be stirred above, without any further trouble. The half spouts at the sides are very useful for admitting air there also, and moving the grain, which would otherwise remain always close to the wall, which must be lined with deal, or plank, closely jointed.

Care must be taken, that the lower edges of the spouts be at least an inch lower than the bottom of the air-holes, that there may be no probability of their being interrupted.

* Spouts like these might be advantageously applied in ricks or stacks to prevent them heating; but for this purpose should have slight cross bars at every foot or 15 inches in length.

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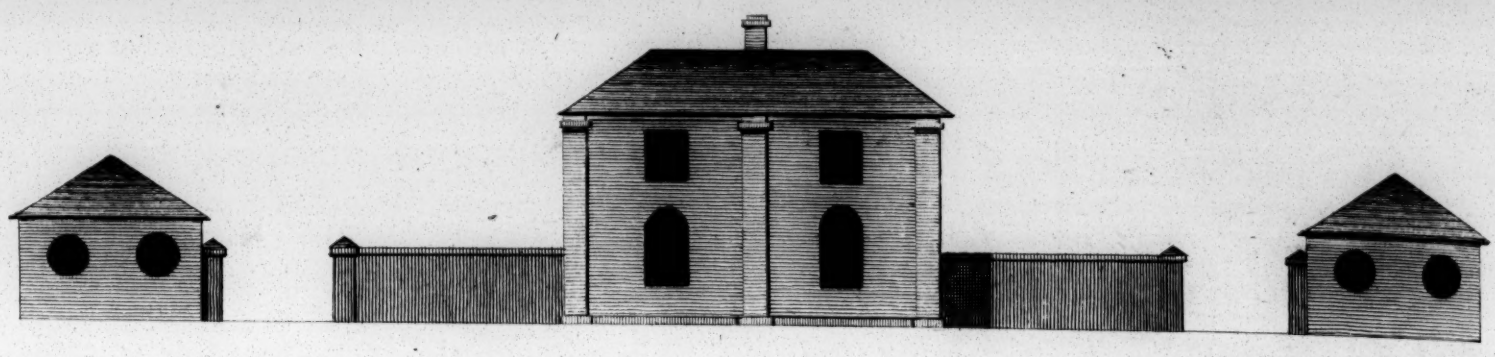
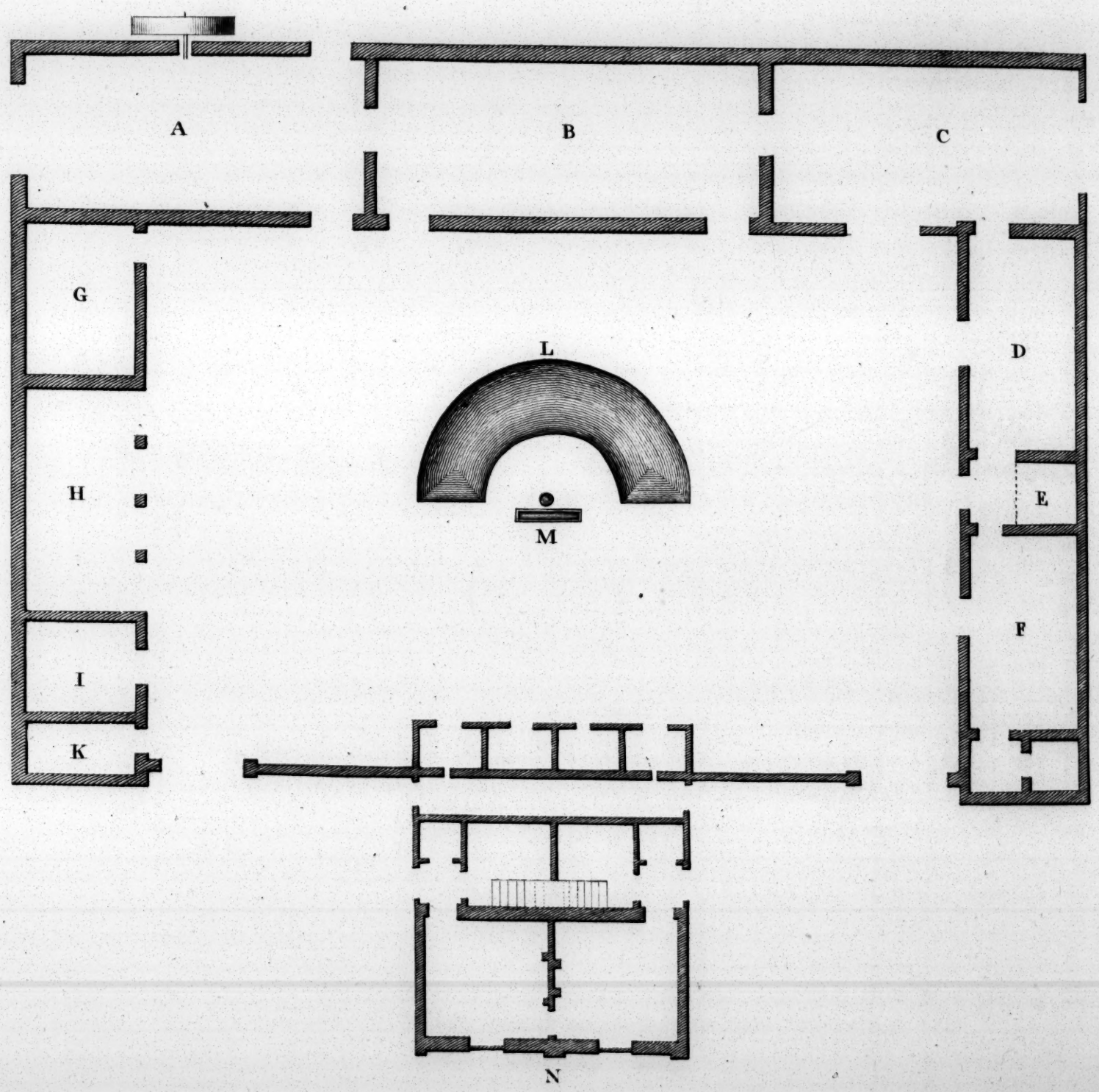
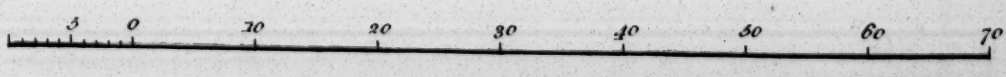
Plate XIX.

Design for a Farm House & Offices.

Vide Page 55.







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Perhaps it might be an improvement to have a ventilator on the top of this granary, to make the current of air incline upwards as well as through the spouts.

The principle of this granary may be applied on any scale, from the corn-chest in the stable to the most extensive granary.

If a corn-chest is to be made on this plan, it should be of a cubical form, and the bottom of it made like a hopper, with a slider, as represented at *g*, or *i*, fig. 2. the aperture being placed about eighteen inches from the floor, to give sufficient room to take out the corn. The spouts will be easily fastened from side to side, and the air-holes should be covered with wire.

If a large granary on this principle is required, it may be divided into any number of divisions, similar to that already described; the cross spouts being conducted through air-holes in the partition walls, or to perpendicular square spouts in those partitions. In this manner, different sorts of grain may be kept in the same granary; as is more fully explained in the Practical Treatise on Rural Improvements, where a design of a granary of this sort, on a large scale, is given.

In constructing a granary merely for the accommodation of a farm, it is unnecessary to attend to all those circumstances, respecting strength, situation, &c. which ought to be observed in building an extensive granary, where large quantities of grain are sometimes deposited. A farmer seldom wishes to have a great deal of his thrashed corn on his hands at once; nevertheless, there ought, on every farm, to be a place of security, capable of containing, at least, one third or one half the grain produced annually on the farm.

Where the practice of housing corn is followed, there is little or no room within the barn for a granary; but where this is not the practice, particularly where there is a thrashing-mill, the granary may easily be made over the barn; which, with proper tackle for hoisting the sacks from below, is the most convenient and least expensive place a farmer can have it in.

Plate XIX. is an elevation and plan of a small farm house and offices, arranged in a way, it is presumed, that would be very convenient.

A the barn, with a water thrashing-mill.

B a straw-house, being a continuation of the barn above, for holding a quantity of straw after it is thrashed, or hay, that it may be at hand to give to the cattle in the feeding-house below; which is supposed to be constructed on the same principle (although the plan may be different) as shown in Plate VIII. The upper part of this straw-house may consist of pillars to support the roof, with about eight feet space between them, whereby a good deal of building will be saved. In the floor should be hatches at convenient distances, to put down the straw to the cattle below.

C a court for the dunghill, with a door to it from the feeding-house, and a large entry at the other end, to admit carts to take way the dung. On the outside of this should be a urine pit, in the most convenient place, according to the form of the ground.

D a cow-house, with a door also to the dung-court.

E a calf-pen, with a rail across to keep in the calves, even though the doors are all open.

F a stable, with a harness-room, and place for keeping corn.

G a root-house, over which, or over the barn, may be a granary.

H shed for carts, &c.

I place for keeping large implements, as ploughs, harrows, &c.

K for keeping smaller implements, as spades, shovels, rakes, forks, &c.; and for laying by old iron, and many other useful things, that might otherwise be lost or thrown away.

L is a pond for washing the horse's feet. It slopes down from each extremity towards the middle at L, where it is deepest, that the horses may easily go in at one end, and come out at the other. It should have a rail at each end, to prevent them going in during frost, or when not wanted to go.

M is a pump, with a trough, for the horses or cattle to drink in; especially while other water is frozen, or when the water in the pond is dirty; but if it can be contrived that the water which drives the mill, shall run through this pond, it will at all times be clean and wholesome.

N is the ground plan of the dwelling-house, with dairy, pantry, and various conveniences behind for keeping swine, poultry, coals, &c.

The stair to the upper chambers rises from either side to the same landing place; from whence are a few steps up to the chamber floor. But if any of the former plans given are preferred for the dwelling-house, they will suit the same arrangement.

One material advantage of this arrangement is, that the fodder consumed upon the farm goes progressively forward from the barn yard, through the cattle to the dunghill, without the unnecessary labour generally occasioned by carrying it backwards and forwards: for it comes from the barn yard into the barn A, where it is thrashed. It is then put in the straw-house at B, and given to the cattle immediately below; and after passing through them, it is thrown into the dung-court at C. A rick of straw, or hay, built behind the stable F, or cow-house D, or in a shed contiguous to either, with proper conveniences, will have the same progressive course to the dunghill; for, it will be observed, the communication from these is equally easy from without or within; the rail across the calf-pen being intended chiefly to keep in the calves, while the doors on each side are open when conveying the dung that way from the stable to the dunghill.

Plate XX. An elevation and plan of a farm-house and offices, with two courts, or farm yards.

A is the barn, with a water thrashing-mill.

BB are sheds for holding the straw immediately after being thrashed, by carrying it either way, as is most convenient for feeding or littering the cattle, or till otherwise disposed of.

C a stable.

D a cow-house, or feeding-house. From both of these are back doors to the dung-court, which is supposed to be behind.

E workshop, and for holding timber and implements, or wheels, &c. blocked out.

F house for large and small implements, with spar doors to admit air.

G shed for carts, &c.

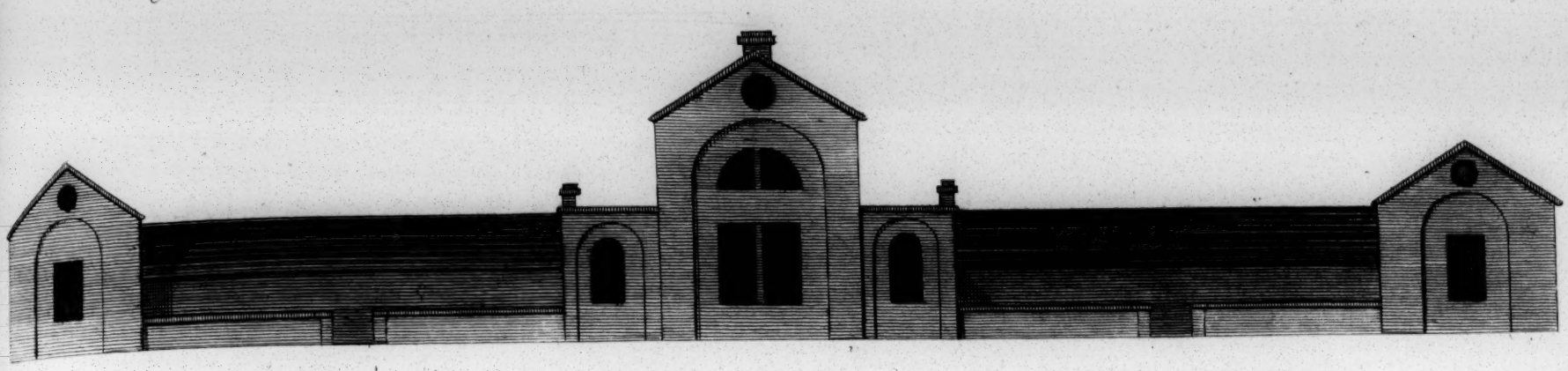
H poultry place, with a pond in it. The nests for the poultry, and roosting places, are under small sheds at each end.

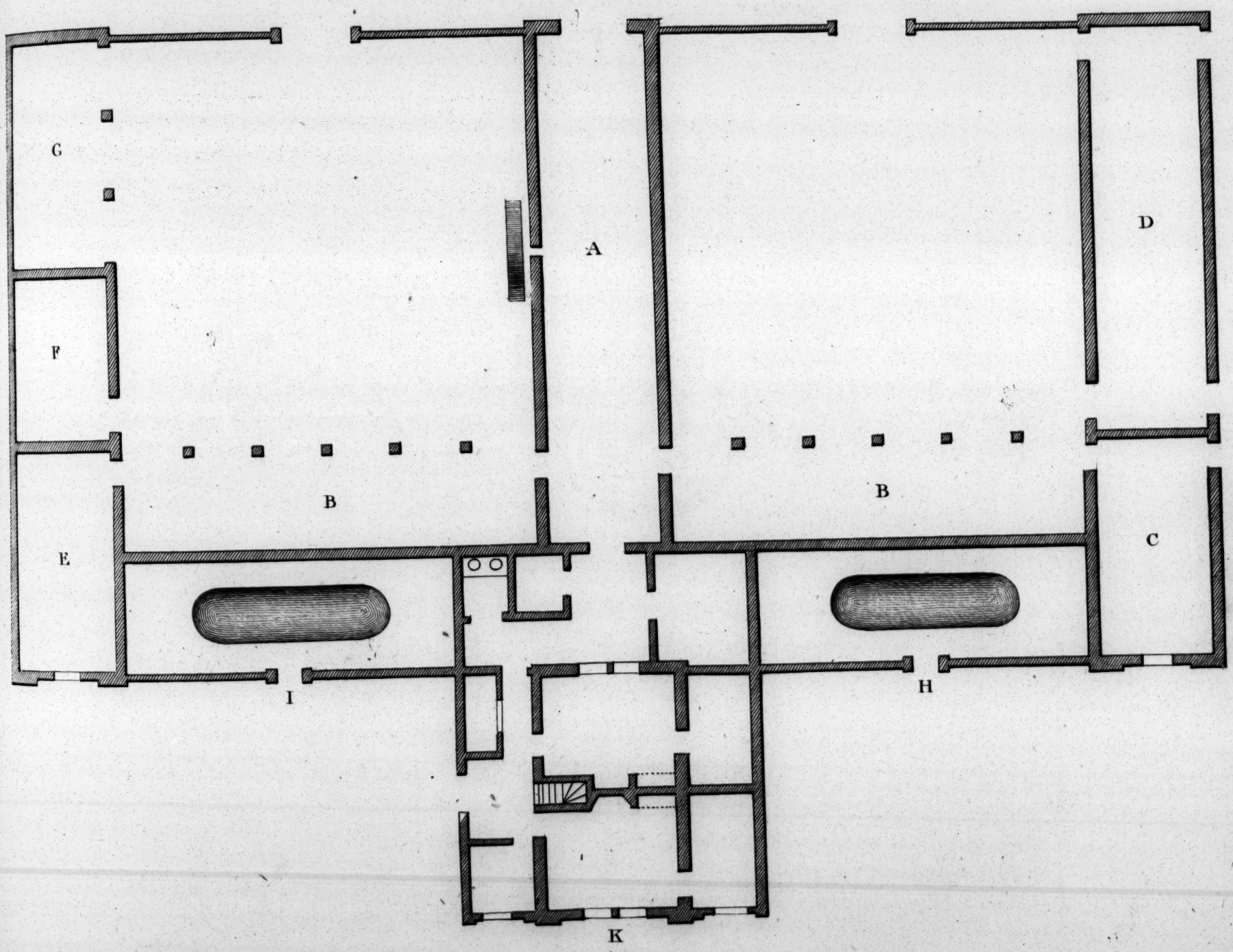
I a similar place, which may be used for keeping rabbits; and the pond may be stocked with fish; both of which, if carefully managed, will, in many places, be convenient as well as profitable. The front wall of these two places is built only two and a half feet high, with a

Plate XX.

Design for a Farm House and Offices, with two Farm Yards.

Vide Pages 56 &57.





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coping, on which is a paling six feet high. This may be made of thin deal, or slabs, set on end; which, being pointed sharp at top, will prevent the poultry flying over, and protect whatever may be kept there from being disturbed.

K ground plan of the dwelling-house, with conveniences of different kinds annexed to it.

In this arrangement, as well as in the former, the fodder goes progressively forward, from the barn yard to the dunghill.

A variety of other arrangements might be given, but these two examples, it is hoped, are sufficient to illustrate the observations already made, and to give a general idea of arranging farm offices, so as to suit any form of ground, and any kind of farm; for it is upon a strict examination and a due consideration of these, that the most commodious plan of the offices suitable to a farm can be properly laid down. Several other conveniences mentioned in the preceding observations, might also have been delineated; but the principal buildings being shown and arranged, it was thought unnecessary to crowd the plates with every little conveniency that might have been noticed; the position of any others that may be required, being easily determined on after the principal ones are fixed.

Sometimes a small square of sheds for cattle is constructed within the court of offices: the sides of this square being parallel to those of the square of offices, at the distance of 10, 15, or 20 feet, according to the extent required. In this case, the cattle are generally fed from without; but the dunghill being in the middle of the interior square, and the space altogether being in general so much confined, it is difficult to keep the cattle clean, or to preserve their dung in a proper state for manure.

For these reasons, as well as for the additional expence of building and roofing in that way, it is not a plan at all to be recommended.

The plan containing two court yards is very convenient, in the event of allowing young stock of different kinds to go at large during winter; as in that case they may easily be kept separate, and fed and attended with no more trouble than if together. In the one court might be kept the young horses, in the other the cattle; or in one of them might be sheds for sheep, if necessary.

II. *Memoir on the Distribution of Farms, Farm Buildings, &c.* *By* Rowland Hunt, *Esq.*

To have no system whatever, and to be a slave to system, are the two great extremes to be equally avoided. The placing all the farm houses of one estate in one village, was often an error in disposition, as it relates to agriculture, but was a matter of necessity in our ancestors, when security was less known in Great Britain than at present.

In the evening, the cattle were in many places driven within a certain precinct, and each village furnished one or two armed horsemen for immediate defence, or for pursuit after cattle driven away by public robbers. Civilization is still benefited by means of schools, and the commerce of society in a village: it is also obvious, that three farm houses in each village cannot be too many, because each may occupy a space of 120 degrees of a circle, which at about half a mile distance, will give to each farm from 200 to 300 acres of land, allowing the garden and small closes to other occupiers: more than three farms would interrupt the great object in view, which is the vicinity of the land to the farm-yard; and less appears to me an unnecessary sacrifice to the plan of separation.

It is necessary to say, once for all, that from the nature and division of land, from the means of obtaining water, &c. the position of villages must be so various, that no one system is recommended as being of superior utility, until every variation of circumstances has been allowed its due weight.

Had I a property of 1400 acres of farming land to dispose of, I would appropriate fifty acres to the smaller tenements in the village, or near it; about six hundred and fifty acres to the three farms which would compose the circular area round the village; and three other farms, containing together seven hundred acres, I would place detached from the village, and from each other; each one in the central position of each farm, as circumstances should guide.

It is a question of much importance, what number of acres in *one* farm is the best quantity for the good of the country? It appears to me, that a great variety of sizes is on the whole to be preferred, that each farm may be adapted to the capital which occupies it: farms of considerable extent, have been found of late a great support to the welfare of this country, when in the neighbourhood of large bodies of mechanics

or miners, because the weight which the one derives from property, as a yeoman, and the other from connection with numbers as a miner, has first produced a balance favourable to the peace of the country, and also has much aided the extraordinary supply needful to a populous neighbourhood. On the other hand, very small farms, such as will support two or three horses and a cow, are of use where vicinity to a market-town, a colliery, a lime-rock, or a canal, may cause frequent calls for a jobbing team: on either side of a canal such assistance completes its utility, and abates the demand for large and expensive teams of horses.

These and other *exceptions* duly allowed, it remains, what is the best quantity of acres for *agriculture* as such? The answer may be decisive: whatever quantity of land will make a farmer the inspector, and not the labourer, on his own farm, without permitting him to be the *commercial speculator* of various markets. If he is a labourer, his industry, however commendable in its principle, generally confines his judgment and narrows his views: when he is a factor, and a rider of markets, his attention is too much scattered, his love of progressive improvement cools apace; and *the making haste to grow rich*, seduces him from the plain and direct road of honest advancement.

A farm of fifty acres makes many a pauper; a farm of a thousand acres makes many a bankrupt: from one hundred and fifty to three hundred acres I have generally seen to produce the best effects; though larger and smaller farms, may, in particular cases, not lead to the bad consequences above pointed out.

The *principle* of *improvement*, on which money should be laid out, is another very important consideration; the real and permanent interest of a landlord and tenant are the same, nor can there be a more degrading or ridiculous position, than that of landlord and tenant sitting down to try who most shall impoverish the other. It is of the greatest advantage to each, that the other should be at his ease: if I pardoned the folly of either, it should be that of the tenant, whose education probably furnishes fewer opportunities of general reflection, and not many occasions of liberal experiment. The opinion of the landlord, when well formed, should be firmly supported. Let us then consider how he might reason. He may suppose that in proportion as the tenant has more facility of getting money he will more readily pay it;—that the tenant has only a temporary, and he a permanent, interest in the farm; he should therefore determine that *permanent* expences should fall on himself; and if judgment is wanted in construction or arrangement he must supply it. That the land in its

naked or unimproved state is of a certain value; and that when built on, drained, &c. it will be worth a certain sum more; let, therefore, a rent be put on his land, and an interest, a full but not an excessive one, be put on his money, and let the tenant contribute by carriage, or by collecting draining materials, &c. as his *douceur* to the bargain, so that his assistance shall be gradual and not oppressive. Let the landlord purchase the manure, the straw, &c. from the going off tenants, and do every thing in his power to make the *going off* to be of the least possible benefit. By proper encouragement, and falling a little into his methods when no material injury is done to the main design, to attach the tenant to the place; by these means, giving him every reason to put confidence in his landlord while he does well, with some cause of apprehension if he perseveres in an opposite conduct.

Above all things let the landlord know his tenants *himself*; the judgment of others will much assist him; their skill, talents, and correction will be of use; but little real good is done where the land-owner is not personally attentive.

What is written above is so very obvious, that I should be unwilling to offer it to observation, if I had not seen the true principle of dealing with tenants, failed in nine times out of ten, by too much eagerness to get rich, or by too little steadiness and perseverance in a reasonable demand.

We will suppose, therefore, the value of the land to be settled; and the principle of laying out money to be ascertained; and having also considered the size of each farm, and their position, as it relates to the estate in general, we will proceed to the situation and construction of the buildings, and of what belongs to them.

Where the *situation* of a *farm house* and yard may be *chosen*, it is desirable that it should be as near as possible to the centre of the farm, all other circumstances well considered; that it should be shaded by hills or woods from the north and east, but quite open to the south, with a few points to the east and west; a bank in a valley will generally furnish most of these advantages, which, if obtained, are a benefit beyond all calculation. The dryness of the grain and provender, and the health and fecundity of the stock, being nearly insured by such a position, as well as the health, activity, and cheerfulness of the inhabitants and their labourers.

Water will probably be found in such a situation, but if it is not, the roofs of the buildings when slated will give a supply, and particularly in winter, when the cattle are generally in the fold.

Fenced roads, both public and private, should be considered as the commu-

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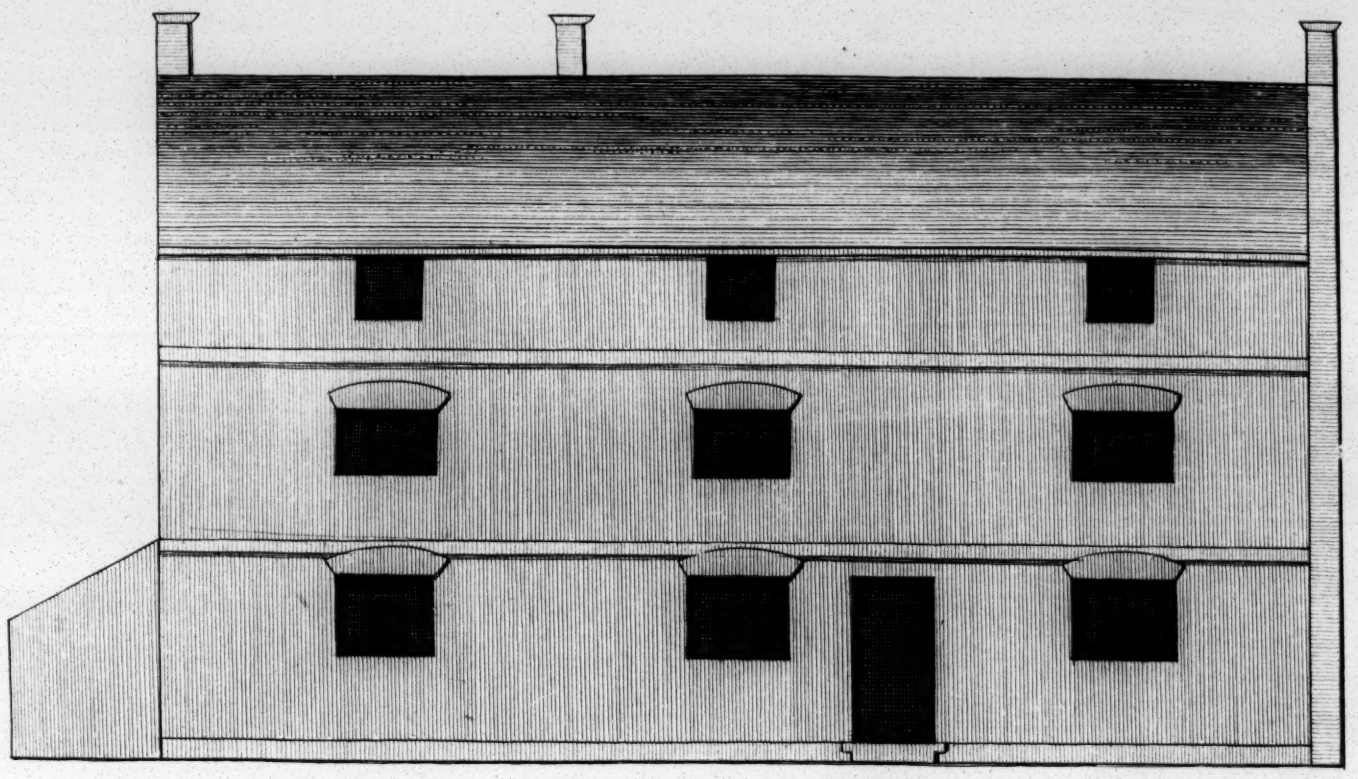

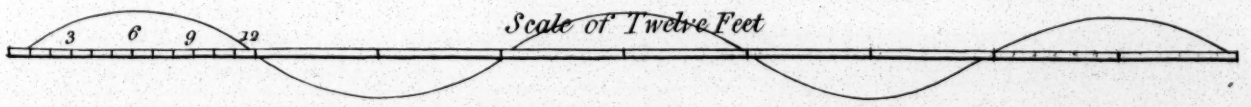

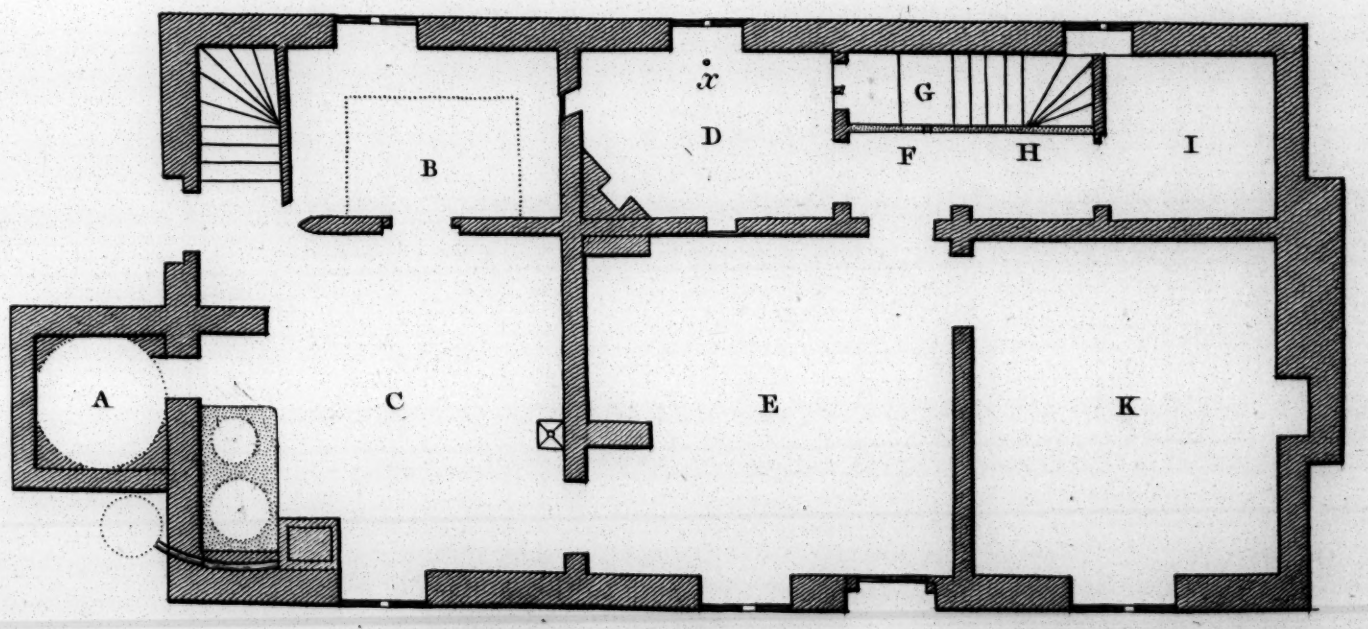

A. *Shed & Oven.*
B. *Milk House.*
C. *Back Kitchin.*
D. *Small Parlour.*
E. *Kitchin.*
F.G. *Passage & Cupboard.*
H. *Stair cases up & down.*
I. *Meat Pantry.*
K. *Parlour.*
L. *Pump.*

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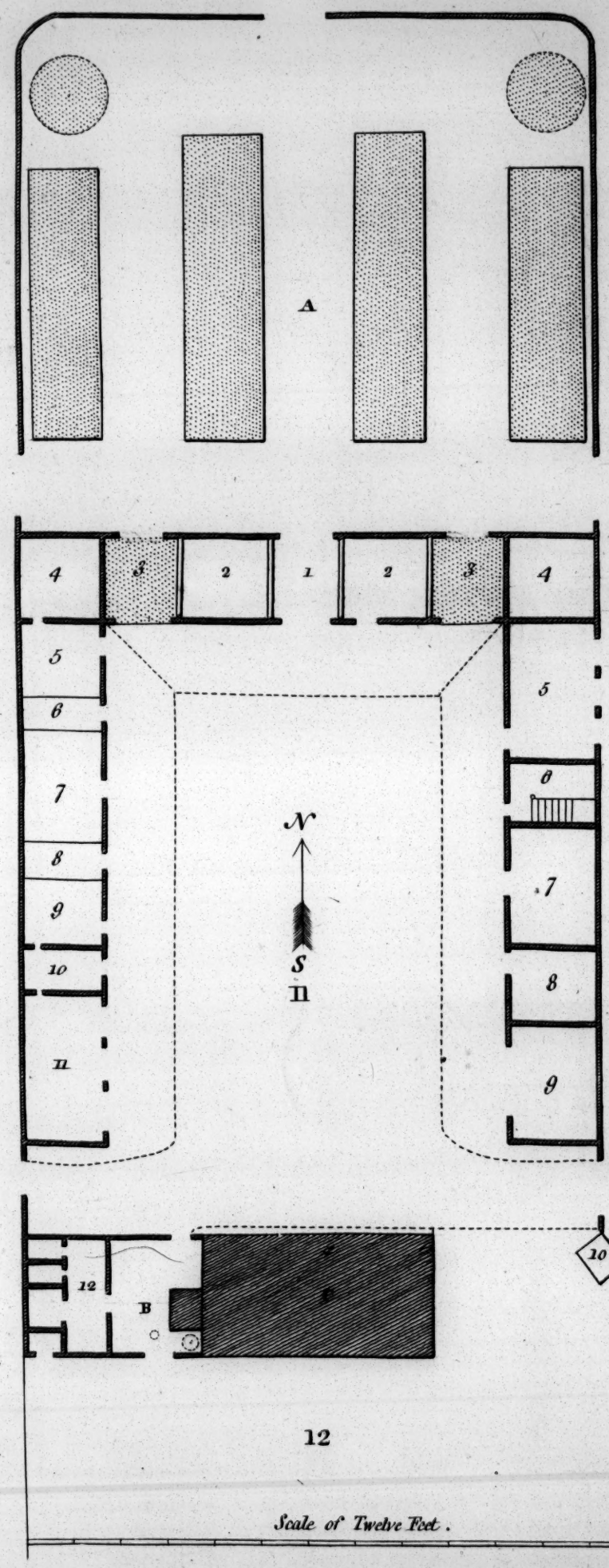
Nº 2. by R.Hunt Esq.ʳ

Plate



Nº1 . Gateway .

2 . Bay .

3 . Barn Floor .

4 . Bay .

5 . Cow-house .

6 . Straw Bin .

7 . Cow-house .

8 . Straw Bin .

9 . Cow-house .

10 . Calves Kit .

11 . Shed .

12 . Pig Sties &c .

B . Pump & Court .

A . Stack Yard .

Nº2 . Bay .

3 . Barn Floor .

4 . Bay .

5 . Cart House .

6 . Ostlery .

7 . Double Stable .

8 . Single Stable .

9 . Feeding Shed .

10 . Horse-block .

11 . Farm Yard .

12 Garden .

C . Position of House - x . of Inspector .

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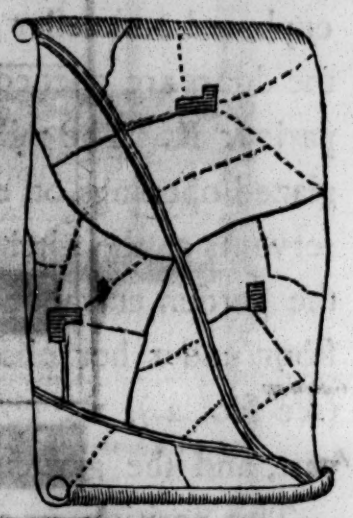
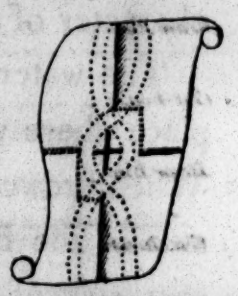
S.Neele . sculp.ᵗ 352 Strand .

nications between fields of the *same* occupier, and not as boundaries between two of them, unless circumstances demand it.



Each farmer has a better communication with his own farm and fields, and interferes less with his neighbour, when a boundary fence *not* to be passed, is their only point of contact. The mode of making roads the boundaries, looks neater on a *map*, but the object of separation is best attained by avoiding it.

The open farm roads should be, as much as possible, placed on the headlands of the fields; that is, the portion of land adjacent to the hedge on which the plough is turned; and every opportunity should be taken of placing gates, so that either side of a hedge may be used as a road, to avoid driving over a field in tillage. This may be easily effected by a few gates, one placed in the line of the headland, not too near each hedge, or to each other, so that a waggon may easily drive through them on the right or left, as the crops may require; a few hurdles may guard each field in grain alternately, and will furnish a useful position to detain sheep, colts, &c. These precautions, although they may appear too minute or particular in a drawing, do in fact prevent an infinite deal of mischief to the farmer, and much assist the cause of industry. To obtain water, in as many fields as possible, need scarcely be mentioned, or to contrive that one pond shall supply several inclosures. All these points should be well considered *before* the position of the house and farm is determined on. The great principle which should guide the construction of a farm house and yard is *inspection*, from a single point.



General Bentham's Παναπτικον is the perfection of this system, of which we must try to obtain as much as can be adapted. I had formed one farm house and yard with this object in view, before I had the good fortune to be introduced to the acquaintance of the General, by whose observations I was much confirmed in a system, which might be infinitely improved by a person of his very superior talents. The distribution of water may be managed with like attention to its position and direction.

No. 1. The plan of a farm house; and No. 2. that of the same house on a reduced scale, with the farm yard annexed, was the second attempt I made on this principle. The position of the farmer's wife, as home inspector, is supposed in No. 1. to be at *x* in the small parlour D. Within the house, she looks through a door with

panes of glass fixed in it, along the passage F and G, on the side of which are the cupboard and cellar; beyond, she looks on the door of the meat larder at I. When the doors are opened, she can see the sempstress, tailor, or children, at work in the parlour K. The milk-house, back door, and staircase, are commanded through two glazed openings on either end of the milk-house; and through another she sees the servants at the kitchen fire; and also through the opposite window the garden, and the garden entrance into the kitchen: having thus almost the whole of the ground-floor under her observation, though employed in a single spot. *Without* the house (see No. 2.), she commands the whole of the farm yard, barns, and stack yard in part, and the garden in some measure, as above.

This position, in case of illness, will much assist the farmer himself, and satisfy him that things are going on well: and if the characters of the farmer and of his wife are good, in temper and judgment, the servants will improve and exert themselves, because their efforts are noticed; they should consider that nothing is more opposite than the character of an inspector, and that of a spy.

The water in No. 1. and 2. is situated so as to carry itself, when pumped, to the place where wanted—into the boilers, the pig-sties, the pump court, and the garden. When brewed, the beer will run down a trough into a clean oak tunnel, on the east side of the back kitchen E, into the cellar, which is under the parlour K. On the east side of the house, opposite to the horse block, is an enlarged window, with wooden shutters, through which the vessels are carried round the house to the pump court, so that the house need not be interrupted by the usual processes of brewing, which are a great impediment to other work, as well as to neatness. The fire in the back kitchen, which is the great laboratory of a farm house, is placed at the greatest possible distance from the farm yard, and as near as possible to the pump.

In the plan No. 2. the pig-sties, 12, on the west of the house have the advantage of pump water, and also of the kitchen wash, which is conveyed by a pipe through the wall into the pump court. 11. Is the shed for young cattle; 10. the calves kit, adjacent to 9, the cow-house meant for calving; 8. a straw bin; 7. a double cow-house; 6. a straw bin; 5. a single cow-house, with an opening to a barn bag, that when emptied as the spring advances, the larger calves may have more liberty; 4. 3. 2. act as a separate barn; 1. the gateway, separating each barn with sides of a complete building, so that each might stand independently of the other. 5. On the eastern side, is a cart-house, with a granary over it; 6. is the ostlery, or place for gearing, chopping straw, &c. with a staircase to the granary; 7. a double stable; 8. a single one;

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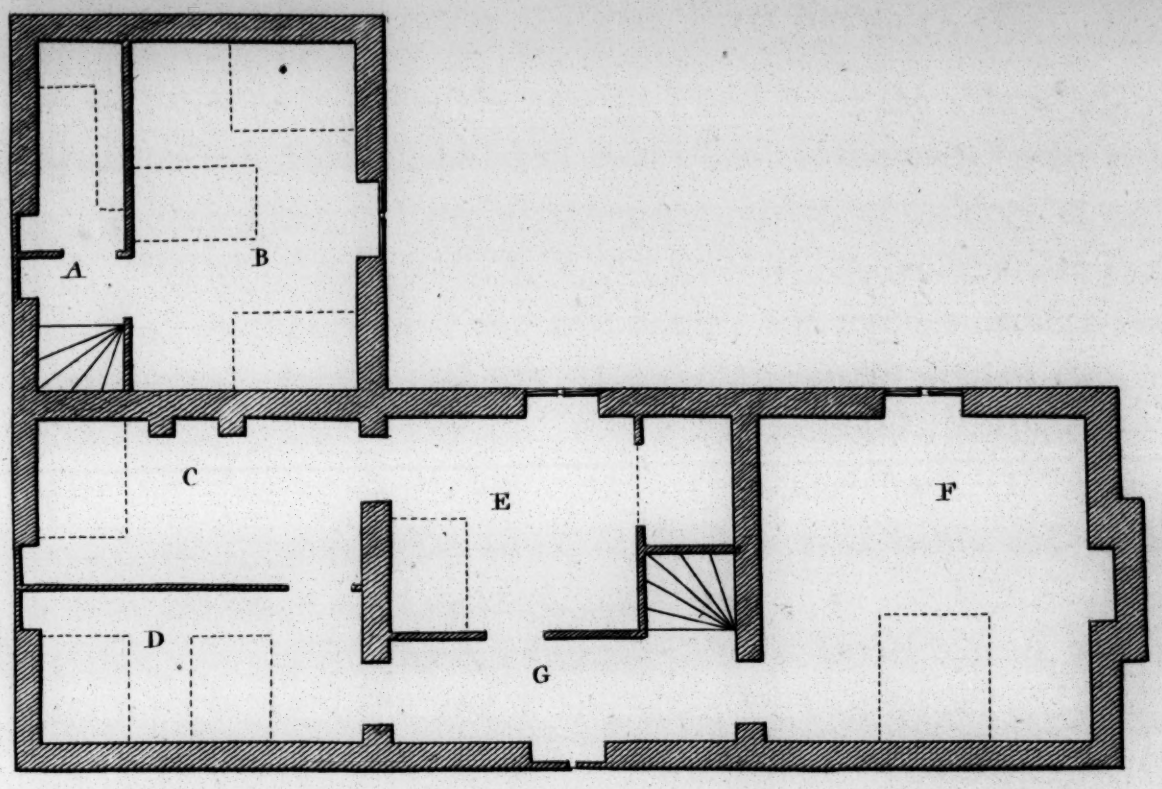
N.ᵒ 3. by R. Hunt Esq.ʳ



Upper Story.

A. *Cheese Room.*

B. *Mens Bed chamber.*

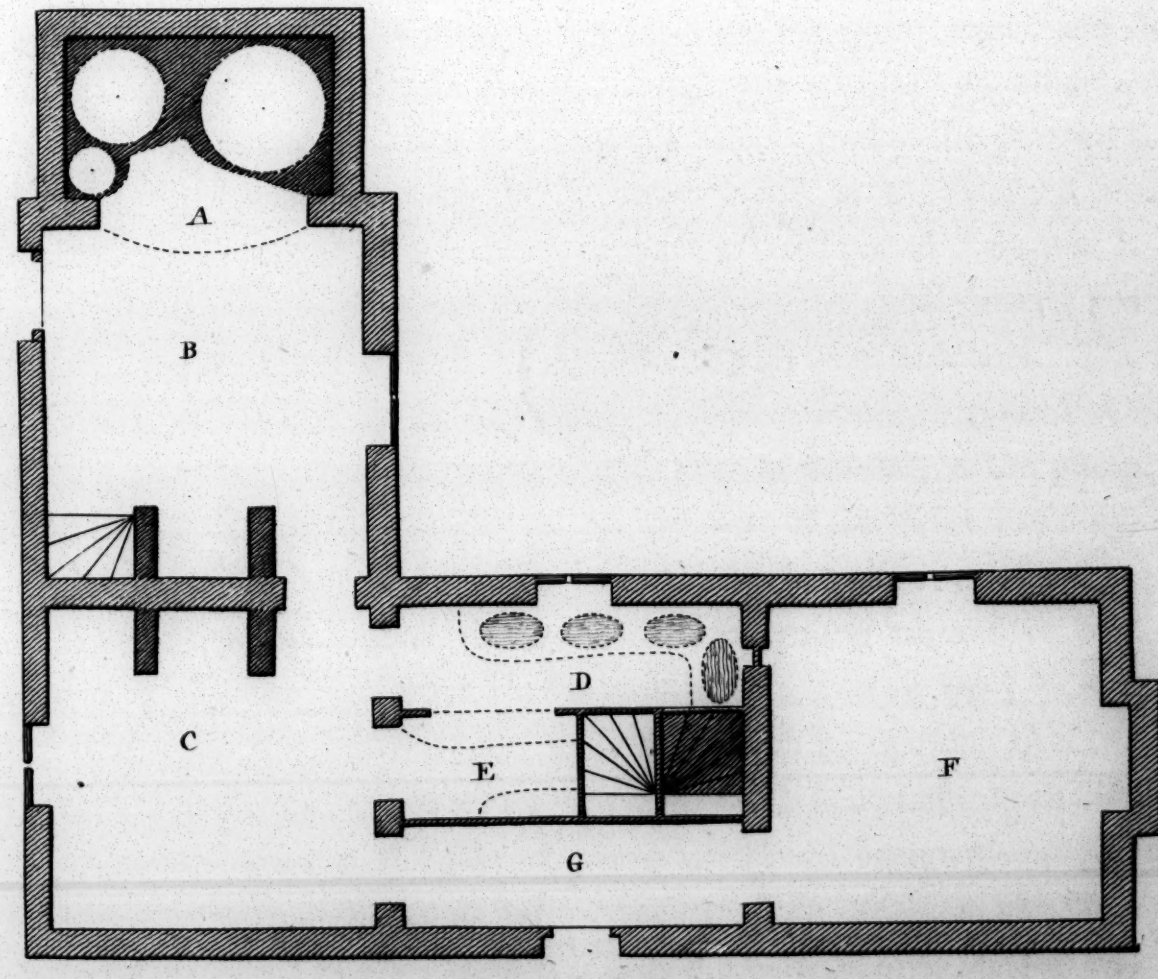
C. *Bed Chamber.*

D. *Bed-Chamber.*

E. *Bed-Chamber.*

F. *Best Bed chamber.*

G. *Passage.*



Ground Floor.

A. *x Pump. Boilers. Oven.*

B. *Back Kitchin.*

C. *Best Kitchin.*

D. *Milk Room.*

E. *Pantry*

F. *Parlour*

G. *Passage.*

3 6 9 12 *Scale of Twelve Feet.*

R. Hunt del.ᵗ

Neele sculp. 352 Strand.

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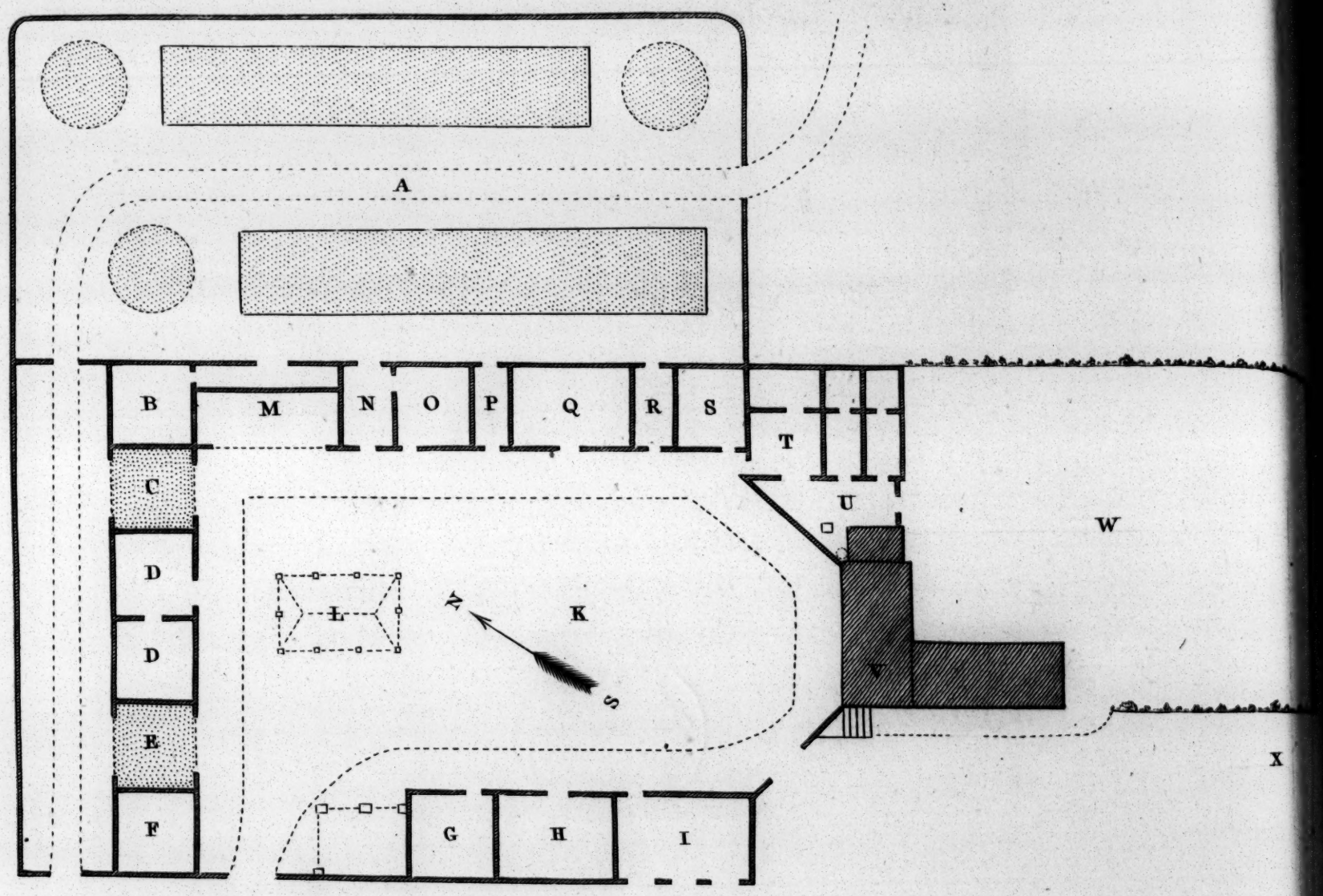
N.o 4 by R Hunt Esq.r

Plate XXIV

A *Stack Yard*
B *Bay*
C *Floor*
D *Bay*
D *Bay*
E *Floor*
F *Bay*
G *Stable*
H *Stable*
I *Cart house*
K *Farm Yard*
L *Pump*



Scale of Twelve Feet

M *Feeding Shed*
N *Calve's Kit*
O *Cow House*
P *Straw Bin*
Q *Cow ties*
R *Straw Bin*
S *Cow ties*
T *Pig sties*
V *Pump Court*
U *House*
W *Garden*
X *Pond*

R. Hunt del.t

Neale sc Strand

9. a feeding shed. The soak of the manure of the farm yard runs through a sough on the western side; under 6. a straw bin, and may therefore be opened if necessary, without injury to the building. The portion of *raised* land on which this farm yard stands is narrow, and therefore I could not spread it more to the east and west, and bring the barn nearer, as I could have wished, to the house: but on the whole I am satisfied with it, and so is the farmer; it cost as near as can be ascertained one thousand pounds (the carriage was not charged); and it bears an interest of 5 per cent. which is paid willingly.

No. 3. In this an attempt has been made to obtain some of the above advantages in a repaired farm building, which was not calculated to unite them all.

A smaller farm house is represented, in which the mistress is supposed to be more at work among her servants in the kitchen at E, or sometimes in the parlour at F. In the latter place, through a glazed opening in the wall, she overlooks her milk-house and pantry, the cellar stairs, and the garden; in the kitchen she overlooks the middel part of the house, where the stores are preserved, the back kitchen, boilers, &c. where the work is carried on, and also the whole of the farm yard, see No. 4.

No. 4. In this plan the rise of ground was of greater extent from NE to NW. The stack yard is therefore placed on the NE side; the pump is placed with the like advantage as in the former plan, so that the water need not *be carried*. As this farm yard is wider than the former one, a shed for young cattle is placed in the centre of it, adjacent to the barns, which I recommend to be done wherever it may with propriety; being open on all sides a stronger beast has not so decisive an advantage over a weaker, as in an inclosed shed; it should be raised at least two feet above the bottom of the farm yard, so that the straw and manure may fall from it, and the cattle be completely dry. A colt house is dotted on the SW side of the stable, which should not be forgotten, as cattle and horses do not well agree together: the same objects are in view in this plan as in No. 2. a particular description is therefore unnecessary. If this building had been new, about six hundred pounds might have built it.

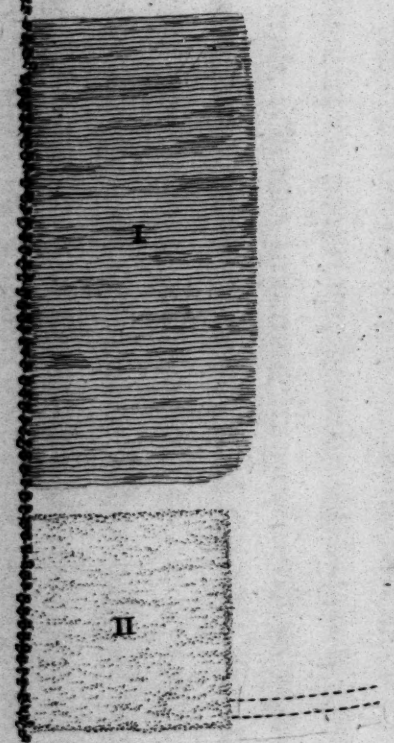
It is an error to suppose that new building is cheaper than the repair of old buildings, except in extreme cases; it may want even more judgment, because new improvements are to be ingrafted on ill constructed edifices; it may, however, be well worth while: carriage is saved and timber got, and something may be learned from past times, though perhaps in farm buildings less than in any other point: the advantage of aspect, and of good arrangements to shorten labour, seem to have been

little studied by our ancestors. It should be recollected, that all money laid out on an estate *unnecessarily*, is a *burden* to the tenant, or a *loss* to the landlord.

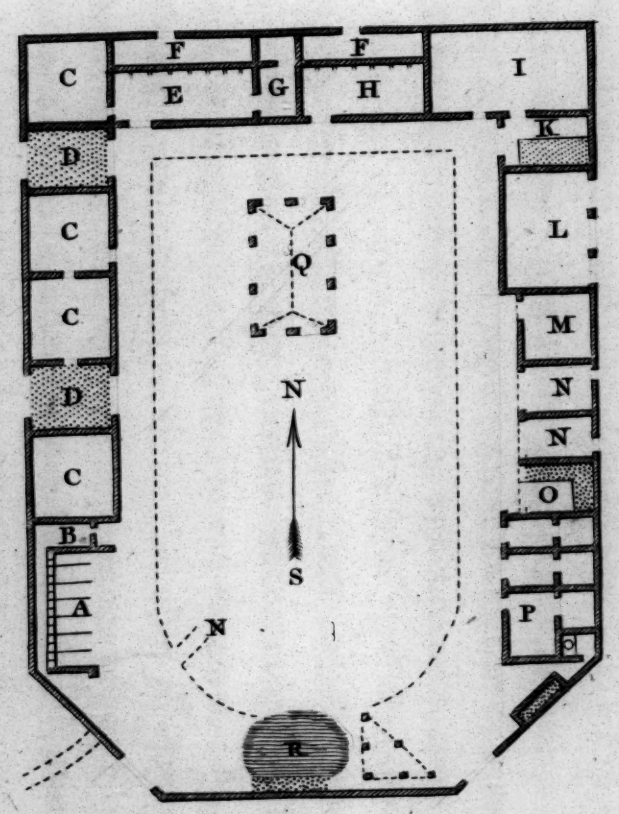
No. 5. represents a farm yard belonging to a gentleman's house, at some distance from the mansion itself.

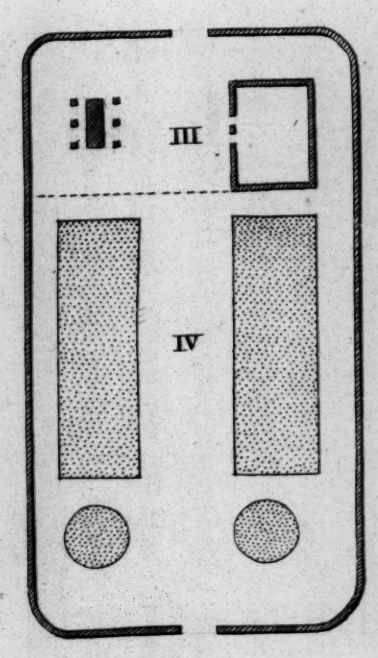
On the left, A is a shed and stalls for feeding oxen. B is a small store-house for turnips, which communicates with C, a bag of the barn, and may be used occasionally as a repository for food in hard weather: a bag, as in other cases, is placed one on each side of the two barn-floors. The upper bag on the NW angle, communicates with the cow-house, to be used occasionally for calves when kept for rearing; and the bag in the centre opens to the yard, both for clearing the barns, and also for the admission of sheep in the shearing time. E is the cow-house. G the calves kit. K the ox-house. F the bins for provender, fitted from the talents above. I the great stable. K the ostlery, for chopping of straw, &c. with a small bed-room over it for a waggoner's boy, and with a staircase leading to it, and also to the granary, which is over L the cart-house. M is a small stable. NN two colt-houses which admit the colts from *without*, with pailed gates to carry the dung to the farm yard within. O the place for poultry, the fowls going over the loft which covers the pigsties, and which should be made light and airy by means of wire lattices. P the pig-sties with a covered feeding trough on hanging doors, and with a large deep stone cistern adjacent, covered with a wooden lid to preserve the grains as long as possible. R is a small pond, with a goose-crew at the head of it, and a small railed triangular space on the right, within which young pigs may be fed unmolested by cattle; or if pailed, poultry may be fed, and the pigs at that time kept out; so that each party may have the food allotted to them.

At *x*, begins the sough which conveys the farm yard soak, till it arrives at the bed of compost at II, and there enriches the soil; which if removed often enough, and turned, is scarcely of less value than the original dunghill; and thus is completed the agricultural doctrine "that nothing be lost." I. is the principal pond or watering place. III. IV. compose a timber yard and stack yard combined to advantage; the same driving way belongs to both; the building in which the timber is laid up, or worked, may be roofed like a stack; the two round stacks of corn, and also *one* of the long stack frames, should be raised on frames high enough for the sheep to take shelter under in a deep snow, and the other frame supposed to contain provender, will feed them with the least waste, as they neither can lie on their food or tread on it; and therefore they only take what they consume, and do no injury to the rest.



I *Pond*
II *Compost*





III *Timber Yard*
IV *Stack Yard*

A. *Feeding Shed.*
B. *Store House.*
C. *Four Bays.*
D. *Two Barn Floors.*
E. *Cow ties*
F. *Two Straw Bins.*
G. *Calves Kit.*
H. *Ox Ties.*
I. *Stable.*
K. *Ostlery.*
L. *Cart House &c.*
M. *Small Stable.*
N. *Colt Houses.*
O. *Poultry.*
P. *Pigsties.*
Q. *Shed.*
R. *Small Pond.*
X. *Farm Yard Drain.*

Scale of Twelve Feet

1 2 3 4 5 6 7 8 9 10 11 12

GR III

The circular figures of the corn stacks, and their shade falling on the flat sides of the others, produce a very pleasing effect, not to be neglected in *this* situation, when nothing is sacrificed to it.

Two observations arise with regard to a gentleman's farm yard, as such; *where*, in point of judgment, it should be placed? and whether, in point of taste, it may form a part of the pleasure ground?

The first is of much consequence; for if united to the stables, garden, &c. the mansion cannot be occupied *separately* with comfort, the owner, on a change of situation, is often driven away. All improvements in or about a family residence, should be so contrived, that the owner, with the full income of the property, may be accommodated; and also that a person with less than half the fortune *may* reside with comfort; every estate finds the want of such an arrangement two or three times in a century; it should therefore be provided for in every building, and in none more than in the position of a farm yard, which induces me to make the observation in this place. It will tend to the frequent residence of some part of a family, and therefore is of no small importance to the agricultural support of an estate.

The next question, whether a farm yard should be shewn, or not? I am inclined to answer in the affirmative. The Abbè Delisle has beautifully illustrated this point in his celebrated work, *Les Jardins*. It certainly costs less to shew it with propriety, than to hide or disguise it: it gives life and *motion* to a country scene; and if the labourers, male and female, have a jacket and hat allowed them, it is no bad opportunity of placing labour in a state and with the appearance of comfort and respectability: it furnishes a proper means of acquaintance between the opulent, and those who labour; and is no bad example to those who may want it. Making the farm yard a part of the pleasure ground, is the life and soul of inspection, and keeps the agent, and others, attentive to neatness and to propriety, because he is always subject to observation himself. The desperate schemes invented by professed surveyors, of raising mounds, sinking roads, boring holes through banks, and the like, with a thousand other tricks thrown in the way of opulence, tend only to increase expence, and to cast a gloom of magnificent solitude around a mansion. Whereas a judicious, but not a forced introduction of the farm and its accompaniments, adds chearfulness and business to the scene itself; and by shewing a union and proportional connexion between the different classes of society, it gives the air of a general and friendly intercourse, which, when properly conducted, is the true spirit of social life at a British residence.

III. *An Essay on Farm Houses, and their various appendant Offices, accompanied with Plans and Elevations, submitted to the Consideration of the Board of Agriculture.* *By* A. Crocker, *Land Surveyor, Frome.*

WHOEVER attentively examines the generality of farm houses, with their appendages, in all parts of the kingdom, will find, that they are mostly devoid of many conveniences and advantages, which they might have possessed, had they been constructed on that systematic plan which their importance requires, and which is absolutely necessary, towards a due regulation of the domestic concerns of a farm.

It was well observed, by an architect of high celebrity, in former days,* that, in every fabric, *three* things were necessary; namely, convenience, strength, and beauty. Although the latter point, may, in the construction of farm houses be, in some measure, dispensed with, yet the two former claim our particular attention; and shall be the leading subjects of this essay, and its accompanying plans.

Every one in the least acquainted with the concerns of a farm house and its homestead, must be sensible of the necessity of the master's eye, taking in, at one glance, all, or the most part, of the continual domestic transactions:—to that end, it is necessary, that the eye should be so placed, as to command *a general view* around.—Although this position be self-evident, yet if we survey the generality of farm houses, and examine the distribution of the rooms and the appendant offices, we shall find them, in many respects, very unaptly disposed and incommodiously placed:—nay, should we be led to consult the modern books of plans, published professedly on this subject, we shall find that those improprieties are not even there, as fully corrected, as might reasonably be expected.

The general and leading idea which I have taken as my guide, in the following plans; is this; the room which the master or mistress occupies, when not actively engaged in the affairs of the farm and the dairy, should be so placed, as to command a view of the transactions of the inferior domestics within doors; and also, that the windows of such room, should comprehend a view of the whole farm yard, and the buildings around it, in the most direct manner. To effect the latter purpose, it is

* Vitruvius.

necessary, that those out buildings be so disposed, as to *stand at right angles, or nearly so, with lines passing from the windows of the sitting room to those buildings.*

Thus, from their sitting room, may the master or mistress have a direct view into the barn, the stable, the oxstalls, the cow-house, the calf-house, the hog-stye, and the granary; and into, and through, the barns, waggon-houses, &c. By which means, the errors of servants and day labourers, may be observed and corrected before mischief ensues;—orders may be given with facility:—regularity and dispatch will then be the consequence.

Having thus briefly stated my idea, of the necessary arrangement of a farm house, and its appendages, I proceed to particular specifications, agreeable to such idea.

It is apprehended that, in the following designs, the *ground plans* alone will be sufficient for the purpose they are intended for: as from thence every one, who possesses the least architectural knowledge, will readily be enabled to lay on the chamber and garret floors:—and no variation of designs in these upper parts, will materially affect the estimate of expence.

The internal finishing must be understood to be plain and neat, with only a few embellishments of any kind.

From my acquaintance with the prices of buildings, in various parts of the kingdom, I am enabled to form my estimates on an *average* of those prices, where the materials are to be met with, at moderate expence and distance from the spot where they are to be used.

It would be highly unbecoming me to trifle with the time or attention of the Honourable Board, for whom the perusal of this tract is intended, in giving these estimates in the detail; yet, for their information, I would beg to remark, that I have calculated the expence of walls (according to their thickness) from *three* to *four shillings* per perch of fifteen feet; paving, with rough flags, at *three pence*, and with chiselled stone at *six pence* per foot;—beam and joisting at *twenty-eight shillings*, flooring at *twenty-three*, roof at *twenty-six*, and partitions at *ten shillings* a square:—plastering with laths at *ten pence*, and rendering at *six pence* a yard.—Thatching at *eleven shillings*, and tiling at *one pound ten shillings* a square.

Other estimates might have been made where different materials are used; but the materials here mentioned are such as may generally be met with throughout the kingdom, and are what are chiefly used in buildings of this nature.—Had it been thought necessary, separate estimates might also have been given of the *labour only*;

that the cost of the following buildings, might have been known, exclusive of the value of timber, &c. which frequently is found on the farm where buildings are required: but this would have led to unnecessary tautology.—I will, however, give some *proportions*, whereby the cost of labour, in either of the following buildings, might be found, viz. wall work of rough masonry, at about one-third of the foregoing charges;—flooring with rough flags at one half; ditto with chiselled work at one-fourth;—carpenters' work at one-third—plastering at one-third—thatching at one-third, and tiling at about one-fourth.

I have also taken the liberty of annexing another design, which, though it may not be strictly consonant to the general idea which led to the construction of the other plans, viz. the giving of a *direct* and *perpendicular* view from the common sitting room, into all the out-buildings of the homestead; yet, as variety is sometimes desirable, I thought it might not be improper, to form one plan on the periphery of an octagon:—and it is not improbable, that such an idea will be approved of by some individuals; especially as its compactness (to borrow a phrase from the ideal Doctor Primrose) gives it "an air of snugness."

The exterior of the principal building, may be constructed on such fancy design as the elevation represents, or on such other as the reader's better taste may suggest; and the interior may be finished in a style, suitable to the rank in life of the proprietor of such farm, as the design is intended for.

Buildings, of the dimensions here given, will be found sufficient, for the management of a mixed farm of £400. a year: the expence will probably amount to about £908.

To conclude, I do not arrogate to myself any merit in this performance, further than such as fairly results, from having duly considered the subject in its various points of view; from giving a humble delineation of my ideas; and from an honest endeavour, to further the laudable and important exertions of the Board of Agriculture.

G.R. III.
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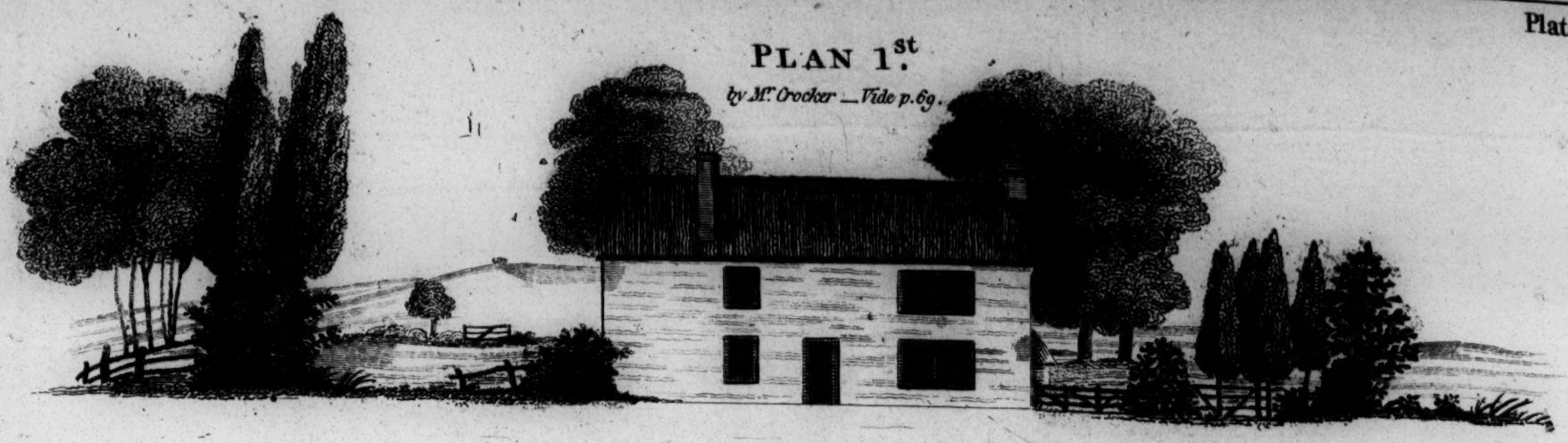
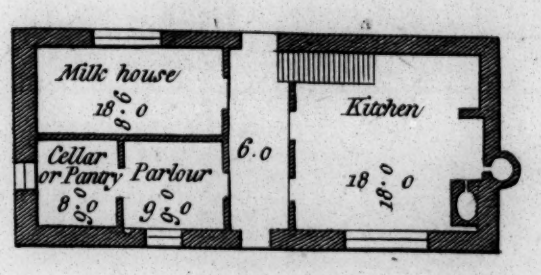
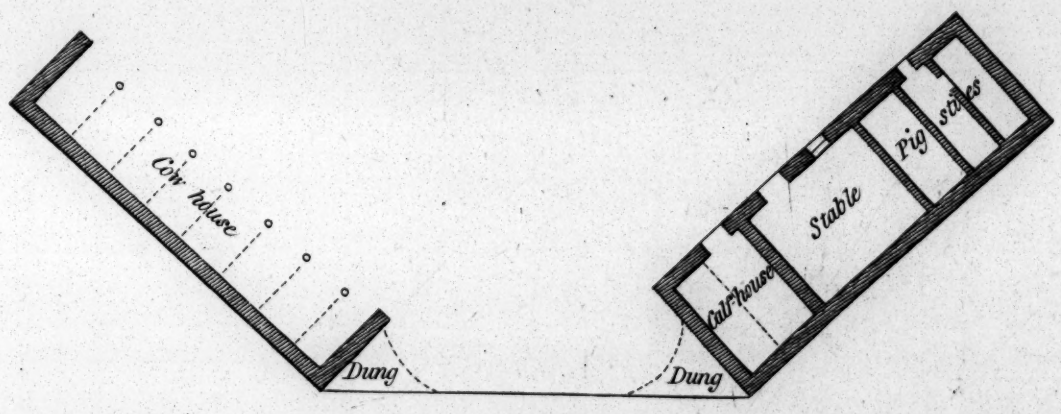
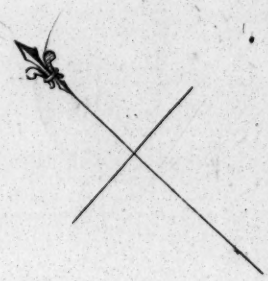
PLAN 1.st

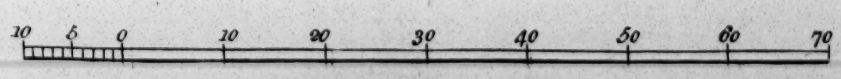
by Mr. Crocker — Vide p. 69.











Scale of Feet.

A. Crocker del.t

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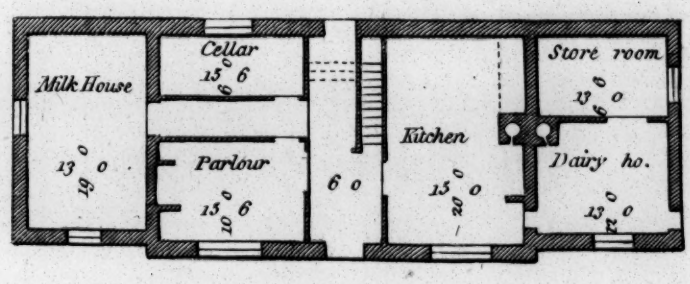
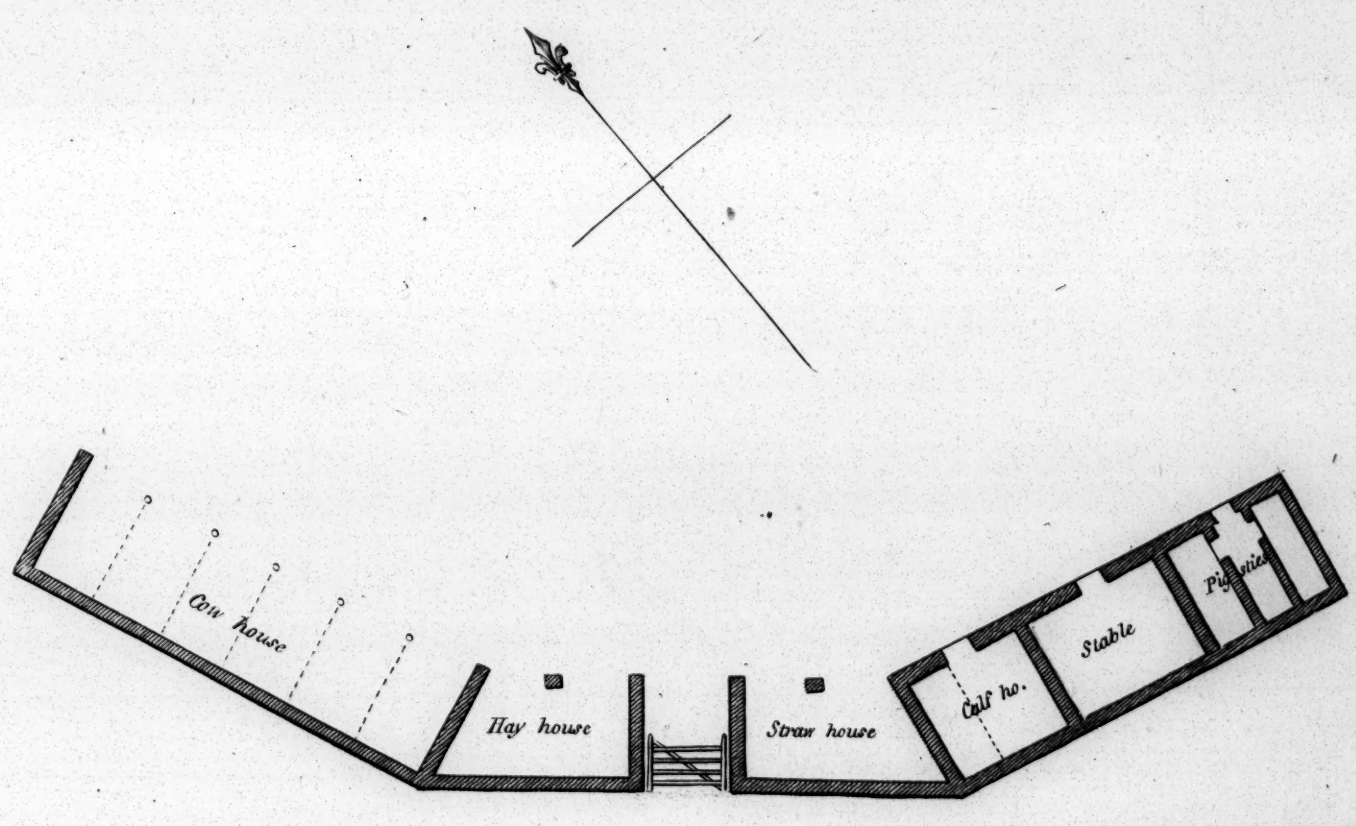
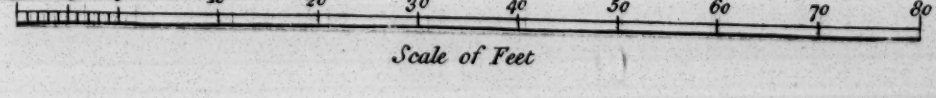
Plate XXVII.

PLAN 2.d

by M.r Crocker. — Vide p. 69







A Crocker del.t

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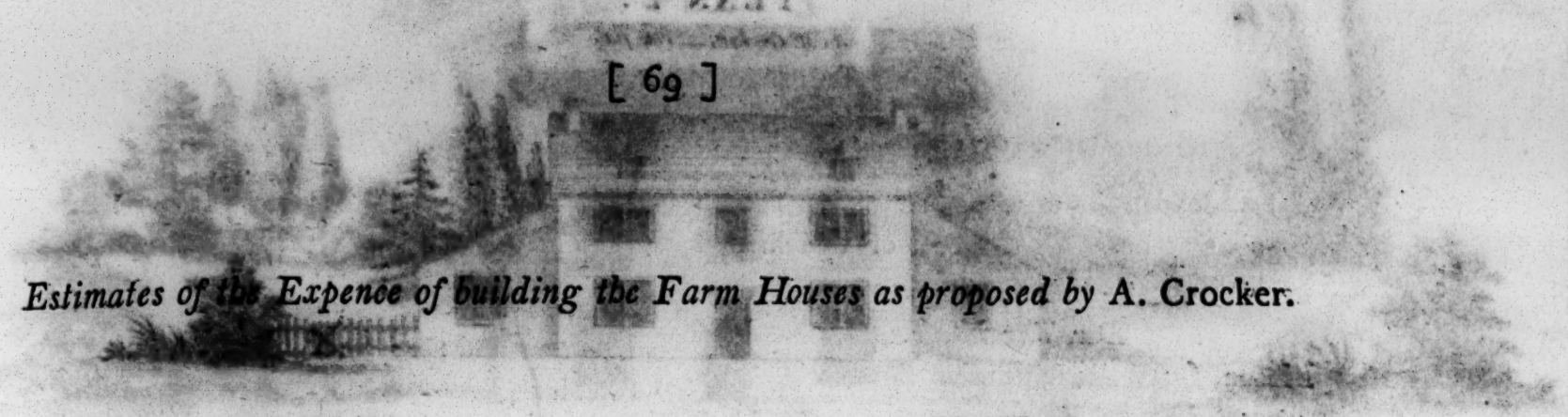


Estimates of the Expence of building the Farm Houses as proposed by A. Crocker.

PLAN I.

Is intended for a dairy farm, from sixty to one hundred pounds per annum; the cost of which will be about £263; as appears by the following abstract of the estimated expence.

Dwelling House.

	£.	s.	d.
Mason, for walls, chimnies, floors, oven, furnace, &c. - -	58	10	0
Carpenter, for lintels, window frames, doors, beams, and joists, partitions, roof, stairs, &c.	92	17	0
Plasterer, for cieling, rendering, and plastering - -	16	3	0
Smith, for locks, hooks, and twists, latches, &c. - -	3	5	0
Glazier - - -	10	6	0
Thatcher - - -	8	13	0
Painter - - -		12	0
	£190	6	0

Out Houses.

Mason, for walls of the cow-house, calf-house, stable, pig-stye, &c.	28	3	6
Do. for pitching or paving do.	8	5	0
Carpenter, for roofs to the cow-house, calf-house, stable, pig-styes, &c. - -	15	16	6
Do. for floors of hay-loft, doors, rack, and manger, &c.	12	18	6
Thatcher - - -	7	10	0
Smith, for locks, &c. - -		16	6
Necessary house - -	1	15	0
	75	5	0
Total	£265	1	0

PLAN II.

Is intended for a dairy farm, from one hundred to two hundred pounds per annum; the cost of which will be about £357.

Dwelling House.

	£.	s.	d.
Mason, for walls, chimnies, floors, ovens, furnace, &c. -	92	4	6
Carpenter, for lintels, window frames, doors, beams, and joists, partitions, roof, stairs, &c.	114	10	6
Plasterer, for ceiling, rendering, plastering, and tiling -	53	11	0
Smith, for locks, hooks, and twists, &c. - - -	3	10	0
Glazier - - -	15	13	0
Painter - - -		18	0
	£280	7	0

Out Houses.

Mason, for walls of the cow-house, calf-house, stable, &c. -	31	15	6
Do. for pitching do. -	8	5	0
Carpenter, for roofs to the cow-house, straw-house, hay-house, stable, calf-house, and pig-styes	17	12	6
Do. for floors of hay-loft, doors, calf-house, rack, &c. -	10	18	6
Thatcher - - -	6	13	0
Smith - - -		11	0
Necessary house to be placed in the garden - -	1	15	0
	77	10	6
Total	£357	17	6

PLAN III.

Is intended for a corn farm, from 100 to £200. per annum; the cost of which will be about £569.

Dwelling House.

	£.	s.	d.
Mason, for walls, chimnies, floors, oven, furnace, &c.	94	11	0
Carpenter, for lintels, window frames, doors, beams, and joists, partitions, roof, stairs, &c.	125	3	3
Plasterer, for ceiling, rendering, and plastering	25	11	8
Tiler	35	10	0
Smith	2	18	0
Glazier	14	14	0
Painter		18	0
	299	6	7

Out Houses.

Mason, for walls of the cyder-house, ox stalls, barns, stable, waggon-house, and granary, and for pitching	80	7	0
Carpenter, for roofs, &c.	66	12	3
Do. for floors, of do. and for rack, manger, windows, &c.	79	16	0
Thatcher	25	0	6
Tiler	11	5	0
Ceiling the granary	1	13	4
Smith	3	3	0
Necessary house	2	10	0
	270	7	1
Total	£569	13	8

PLAN IV.

Is intended for a corn farm, from two hundred to three hundred pounds per annum; the cost of which will be about £737.

Dwelling House.

	£.	s.	d.
Mason, for walls, chimnies, floors, oven, &c.	139	5	4
Carpenter, for lintels, window frames, doors, beams, and joists, partitions, stairs, &c.	154	4	8
Smith, for hooks, &c. &c.	4	12	0
Plasterer and tiler	84	7	2
Glazier	19	9	0
Painter	1	15	0
	£403	13	2

Out Houses.

Mason, for walls of pig-styes, straw-house, stables, barn, waggon-houses, granary, and for pitching	107	15	0
Carpenter, for roofs	87	7	0
Do. for floors of granary, hay-loft, barns, and for rack, manger, &c.	85	2	6
Thatcher	40	14	0
Tiler, for the granary and for ceiling it	6	13	6
Smith, for locks, &c.	3	7	0
Necessary house	2	12	6
	333	11	6
Total	£737	4	8

PLAN V.

Is intended for a corn and dairy farm, from 200 to £300. per annum; the cost of which will be about £595.

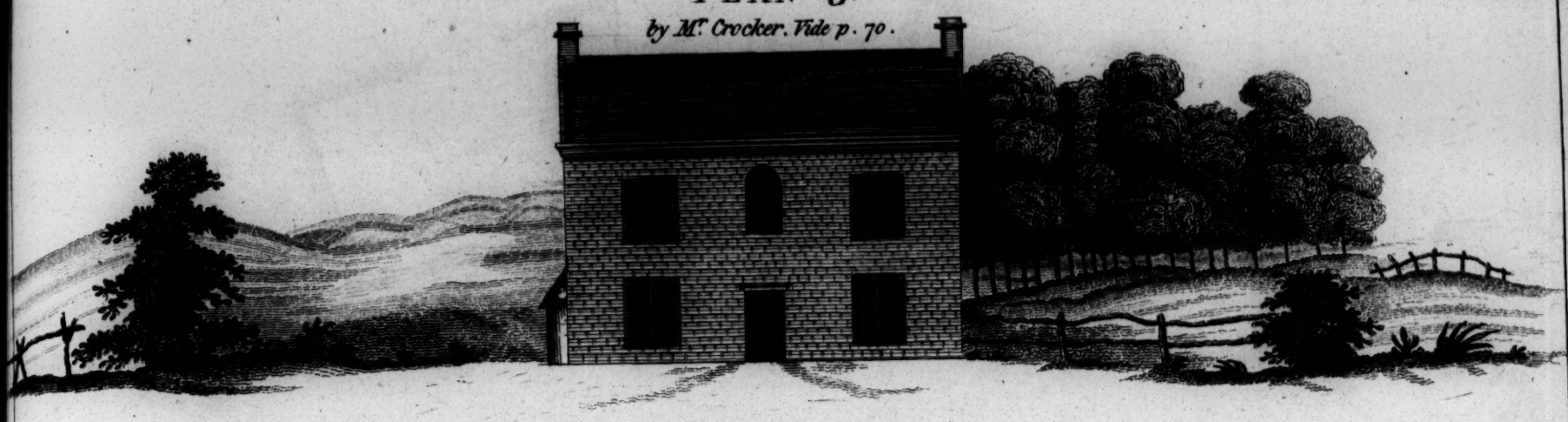
Dwelling House.

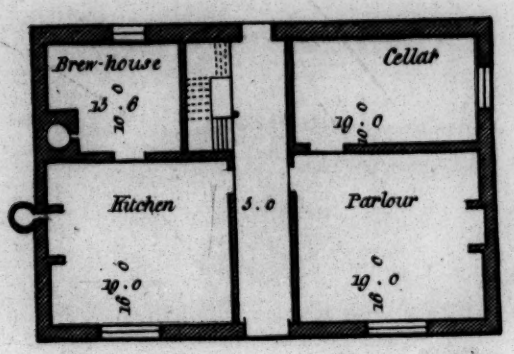
	£.	s.	d.
Mason, for walls, chimnies, floors, oven, &c.	147	7	0
Carpenter, for lintels, window frames, doors, beam, and joists, partitions, stairs, roof, &c.	142	19	6
Plasterer, for rendering, plastering, &c.	44	6	0
Smith, for locks, &c.	5	10	0
Thatcher	16	10	0
Glazier	21	6	0
Painter	2	0	0
	£379	18	6

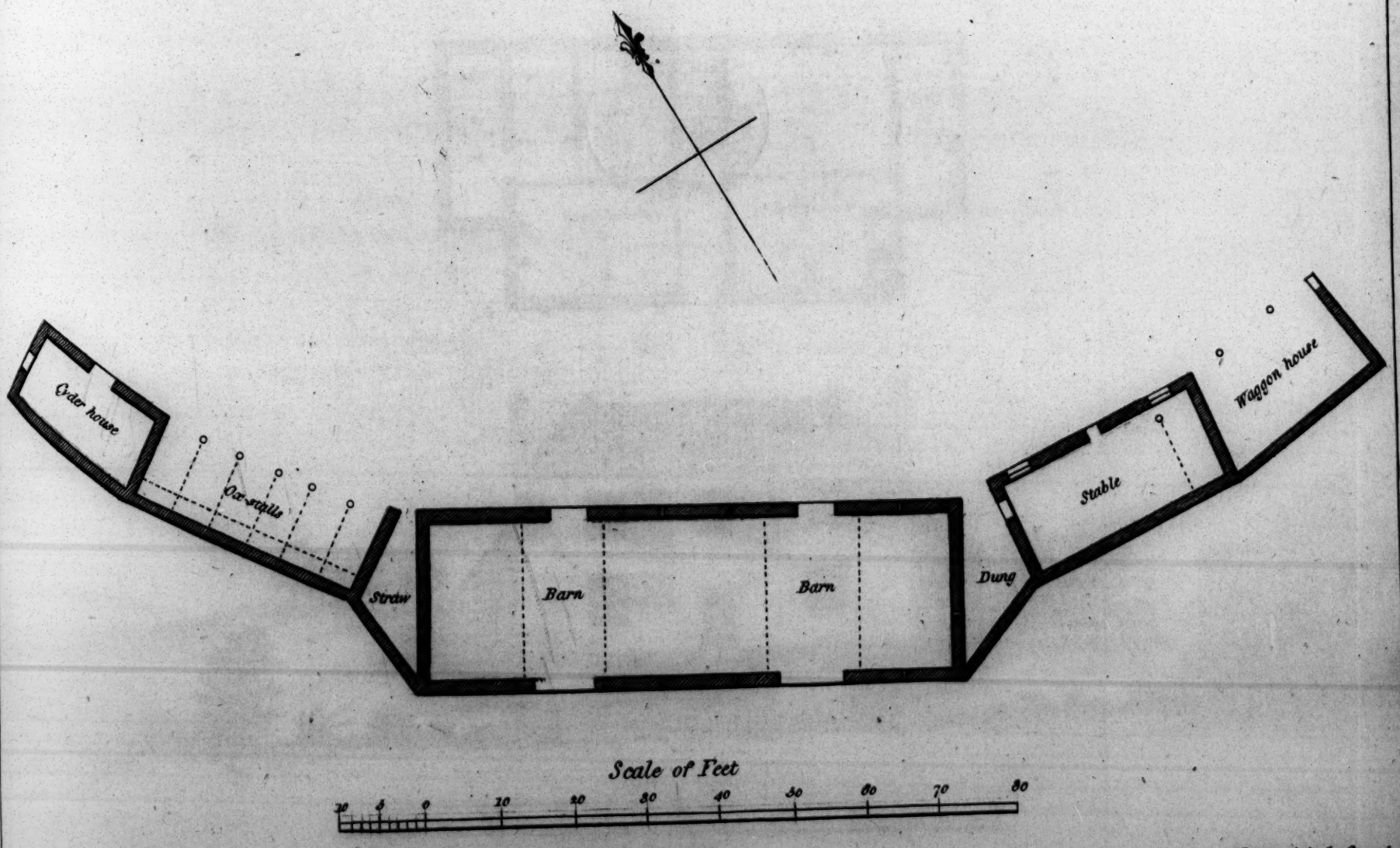
Plate XXVIII

PLAN 3.d

by M.r Crocker. Vide p. 70.







A. Crocker del.t

Neele sculp.t 352 Strand.

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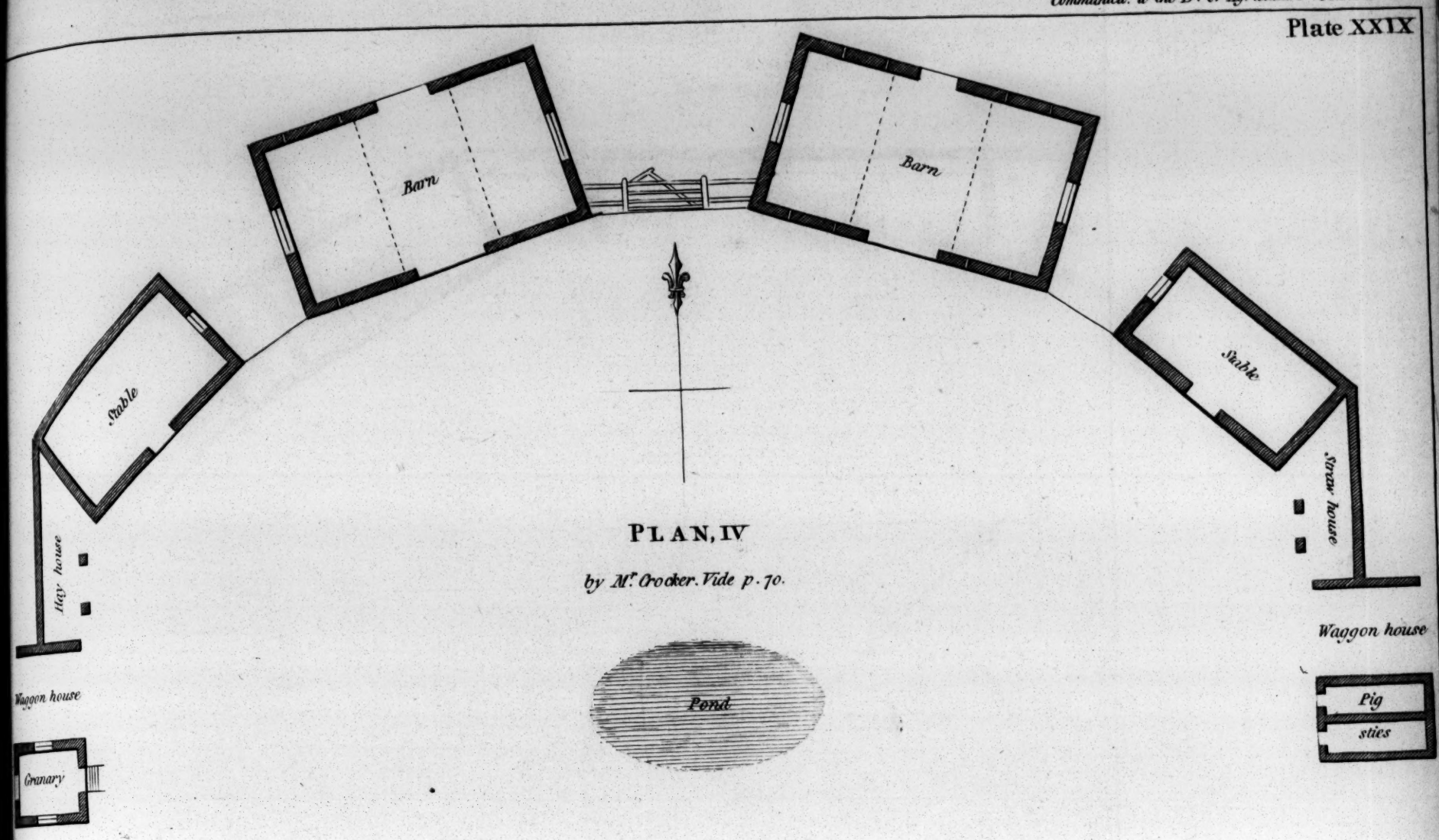
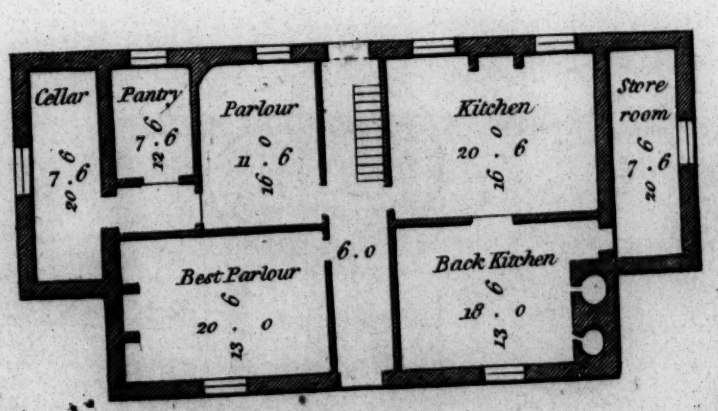
Plate XXIX



PLAN, IV

by M.r Crocker. Vide p. 70.



10 5 0 10 20 30 40 50 60 70 80

Scale of Feet

Neele sc. Strand

G.R. III.
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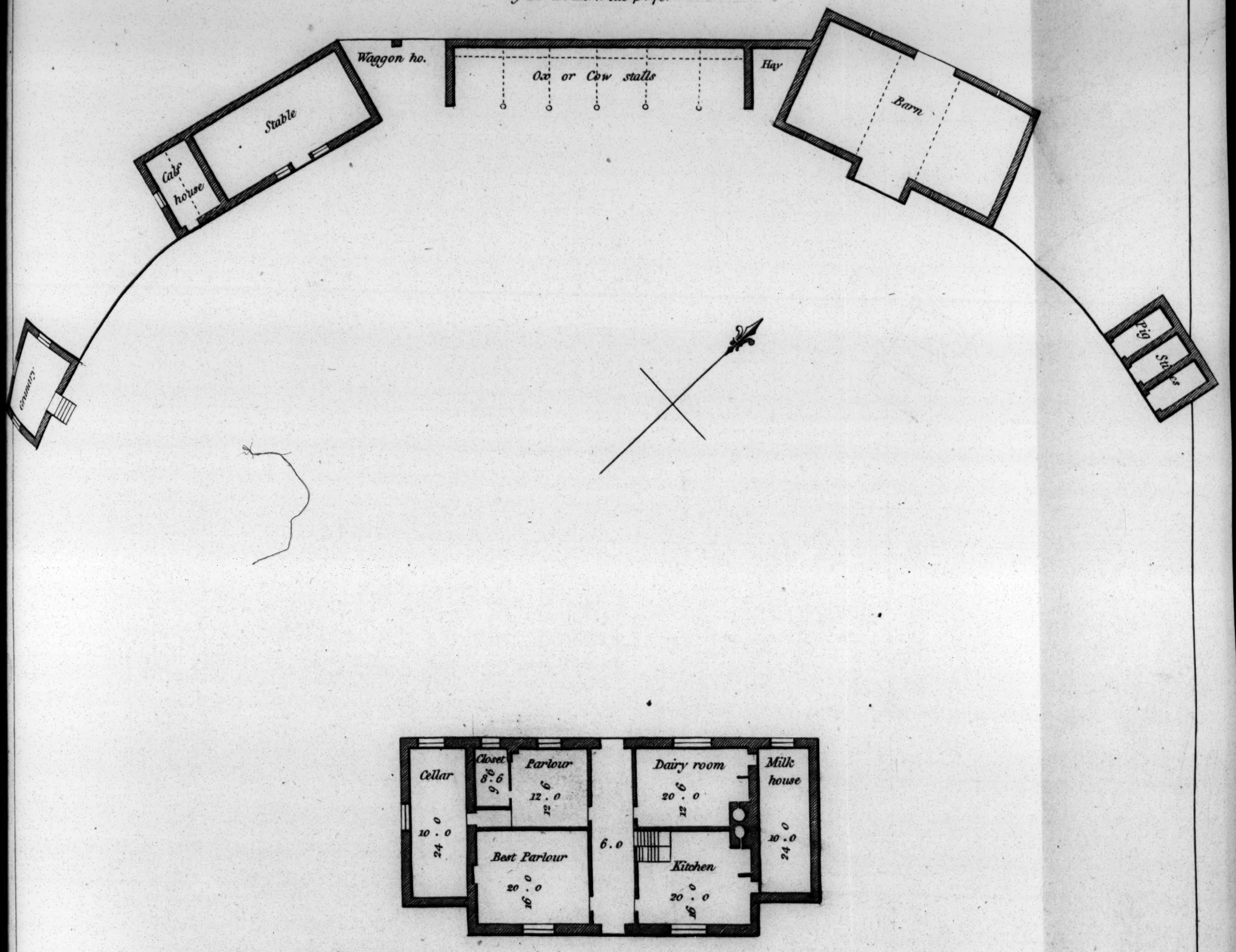
Plate XXX

PLAN 5th

by M.r Crocker. Vide p. 70.



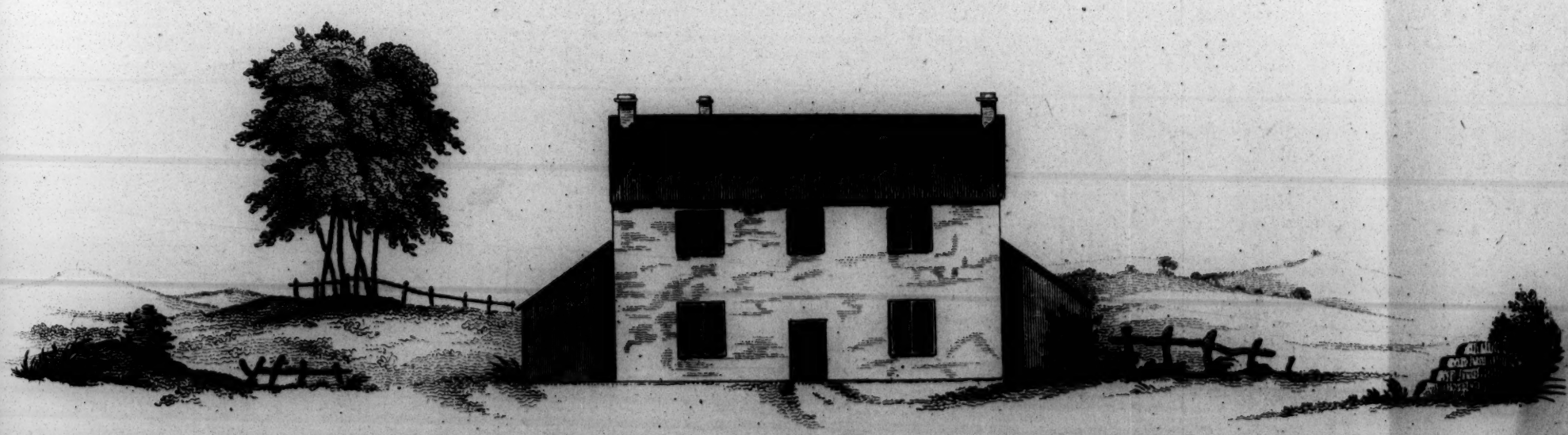
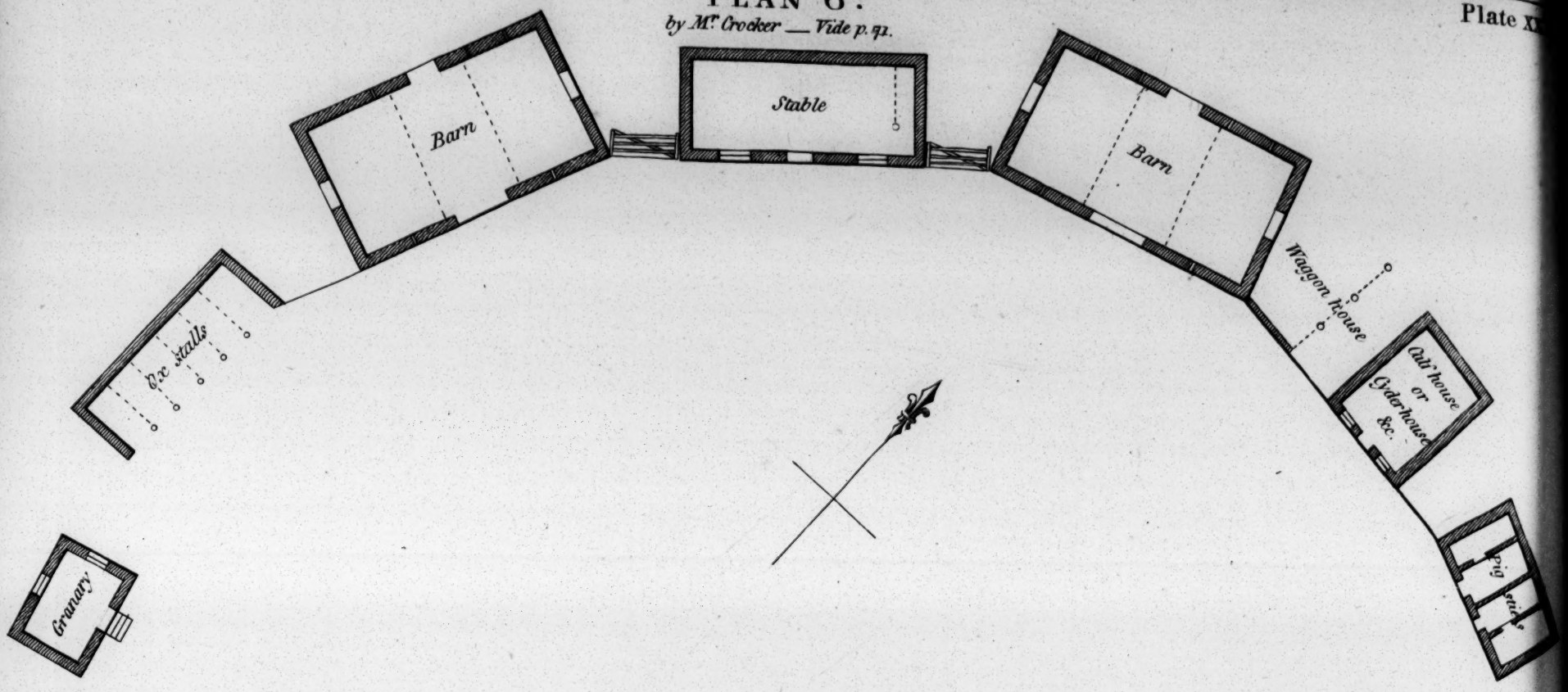
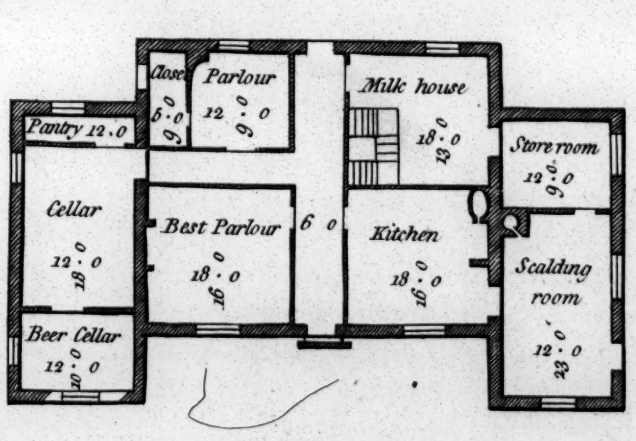


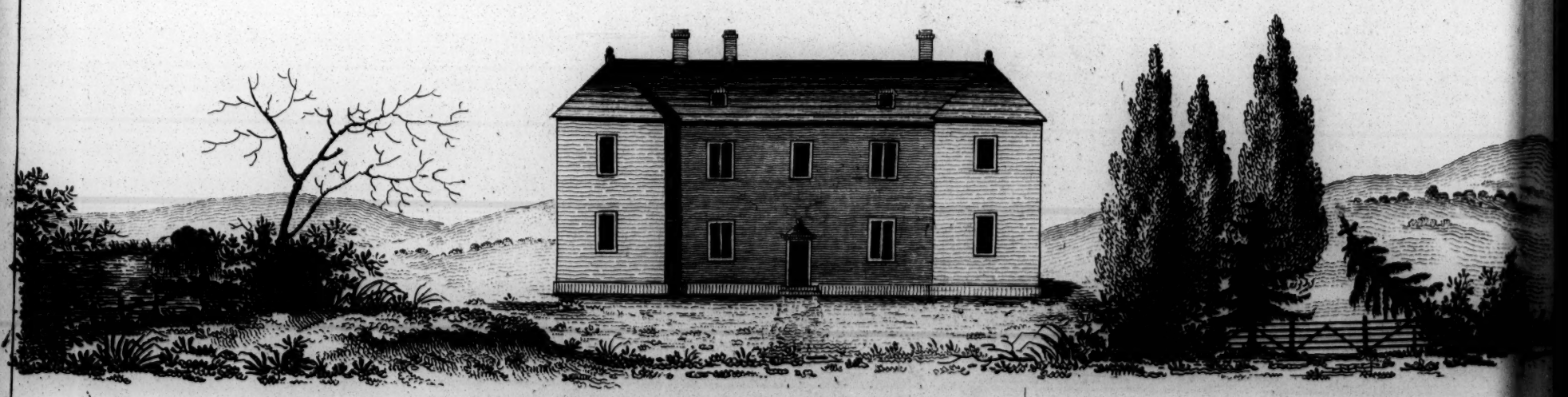
Plate XI

PLAN 6.th

by M.r Crocker — Vide p. 71.







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Scale of Feet.

A. Crocker del.t

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G.R. III.
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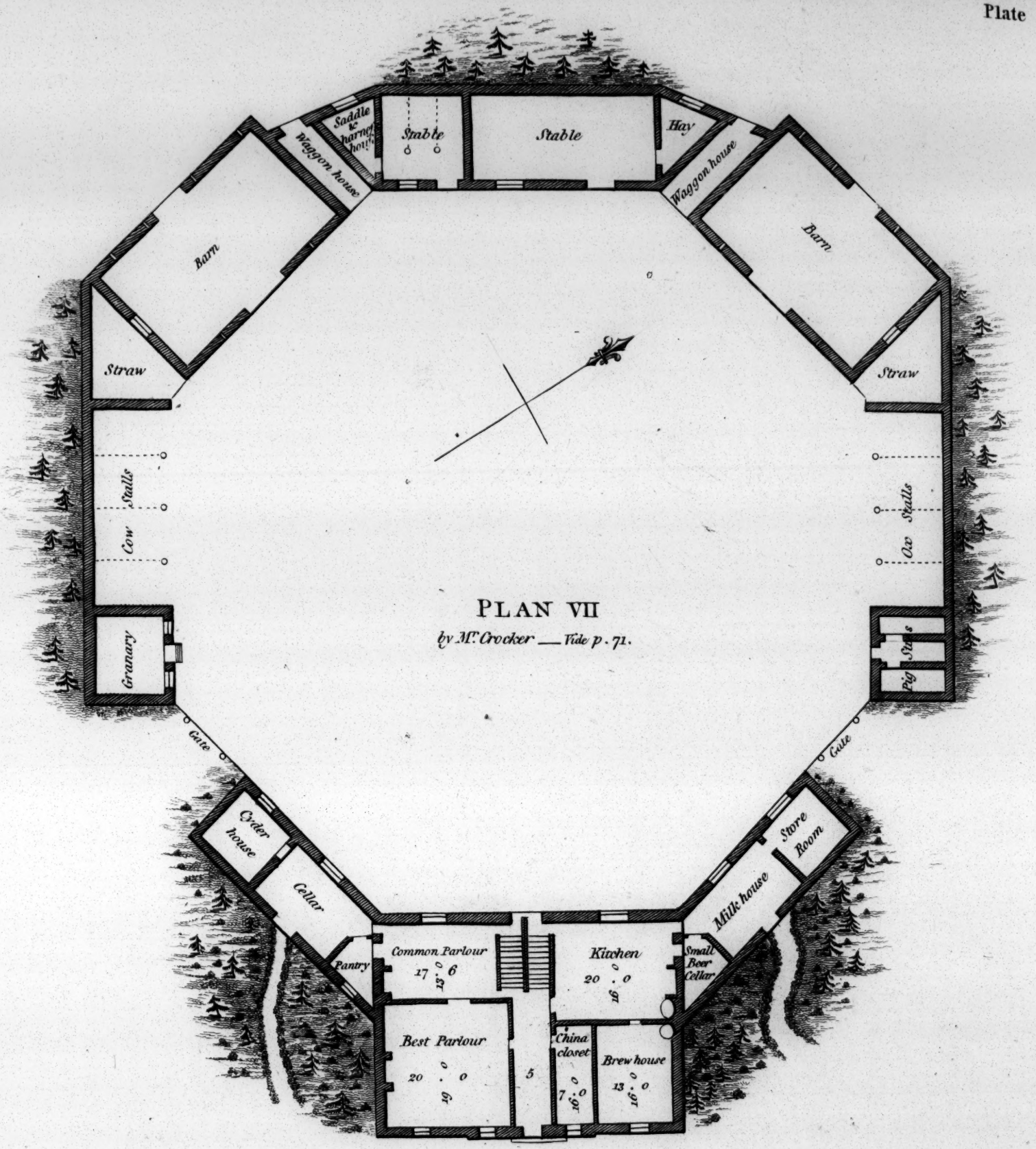
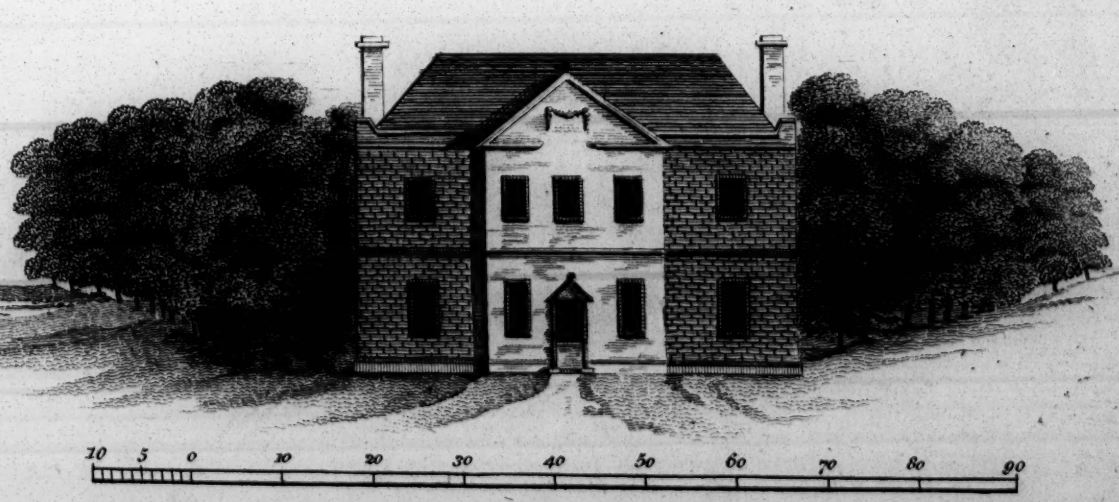
Plate XXXII



PLAN VII

by Mr. Crocker — Vide p. 71.



A. Crocker del.ᵗ

Neale sc. 352 Strand

Out Houses.

	£.	s.	d.
Mason, for walls to the granary, calf-house, stable, ox stalls, pig-styes, and for pitching -	71	12	0
Carpenter, for roofs to granary, calf-house, stable, waggon-house, ox stalls, barns, pig-styes, &c. and for floors to granary, barns, &c. &c. - -	102	17	0
Thatching, tiling, and cieling the granary - -	33	12	6
Locks, &c. - -	3	8	0
Necessary house - -	3	13	6
	215	3	0
Total	£595	1	6

PLAN VI.

Is intended for a corn and dairy farm, from 300 to £400. per annum; the cost of which will be about £766.

Dwelling House.

	£.	s.	d.
Mason, for walls, chimnies, floors, oven, &c. - -	143	11	0
Carpenter, for lintels, window frames, beams and joists, partitions, stairs, roof, &c. -	172	5	0
Plasterer, for rendering, plastering, and cieling do. -	69	5	0
Smith - - -	6	0	0
Glazier - - - -	26	0	0
Tiler - - -	63	0	0
Painter - -	2	10	0
	£482	11	0

Out Houses.

	£.	s.	d.
Mason, for wall of granary, cow-house, barns, stables, cyder-house, and pig-styes, and for pitching - -	123	9	6
Carpenter, for roofs of granary, cow-house, barns, stables, waggon-houses, cyder-house, &c. and for floors of granary, barn, and hay-loft, corn binns, &c. &c.	122	0	6
Thatcher - - -	24	4	0
Tiling and ceiling the granary	6	16	0
Smith - - -	3	8	0
Necessary house - -	3	19	0
	283	17	0
Total	£766	8	0

PLAN VII.

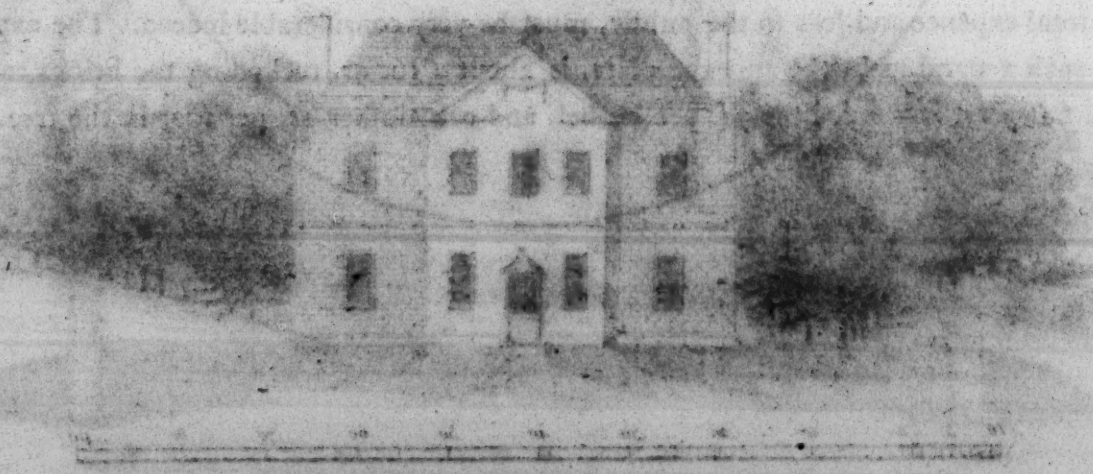
Dwelling House.

	£.	s.	d.
Mason - -	169	16	0
Carpenter - -	199	18	0
Plasterer - -	71	10	0
Smith - - -	7	4	0
Tiler - - -	70	0	0
Glazier - - -	28	5	4
Painter - - -	5	4	0
	£551	17	4

Out Buildings.

	£.	s.	d.
Mason - - -	143	4	0
Carpenter - -	164	4	6
Thatcher - - -	30	18	0
Tiler - - -	7	0	0
Smith - - - -	3	14	6
For a water closet - - -	7	15	0
	356	16	0
	£908	13	4

Frome,
12 *May*, 1796.



IV. *Account of the Corn Stands at Woburn Abbey. By Sir* John Sinclair.

AMONG the various agricultural improvements, which I had the satisfaction of seeing, either carrying on, or completed, in the course of an excursion to Woburn Abbey, there was one, which, on various accounts, I must take the liberty of recommending to the attention of the Board; namely, the corn stands, or walled rick-stands, an engraving of which is annexed. It is well known, that grain in the straw, keeps infinitely better in the open air, than in close barns, that it is less apt to be destroyed by vermin, and that it saves the enormous expence which the building of great barns necessarily occasions.*

No doubt, therefore, can be entertained, respecting the great public advantage to be derived, from attention to this article.

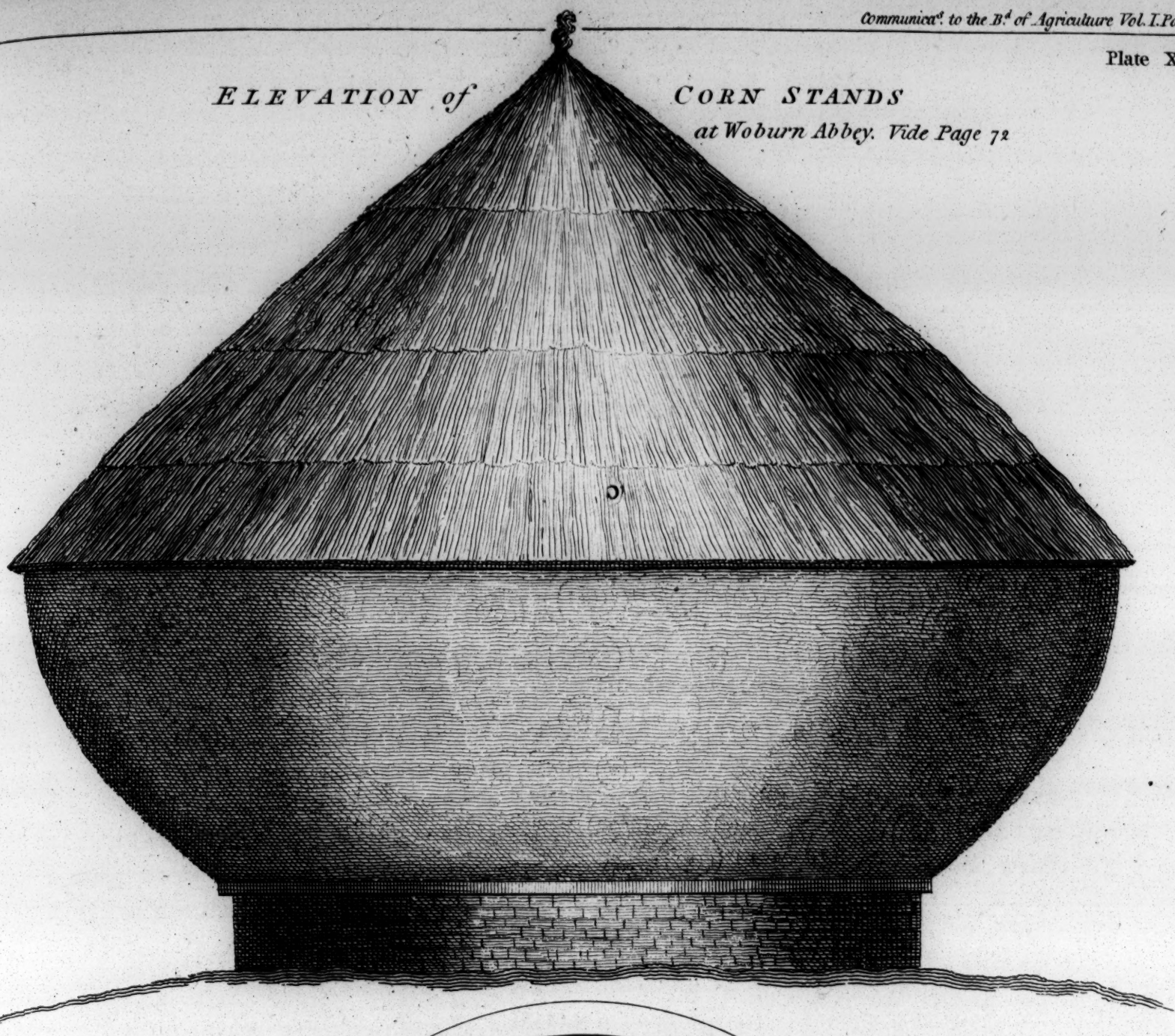
These stands, I am informed, have been for some time in use by the late Mr. Bakewell and in his neighbourhood. They were only erected at Woburn Abbey about two years ago. Ricks, in the form of a parallelogram, of any size, may be constructed on this plan; but for small ricks or cocks, the best form of the stand is octagonal, because the wooden coping may be cut from smaller timber, and with less waste, than the circular ones; and a circular cock is as easily built on an octagonal, as on a circular, stand. The expence of erecting these stands, is but little more than that of good timber frames, on the common construction, especially if they have stone posts and caps; and there is every reason to believe, that the wall-stands must be much more durable. As the foundations are sunk some depth into the earth, and the coping projects some distance, vermin cannot get into these ricks, except by carelessness in letting things lie or accumulate against the walls, or allowing the corn to hang loose downwards over the walls, while, or after the rick is building. Where stone is to be had, it certainly would be an improvement to employ that material,

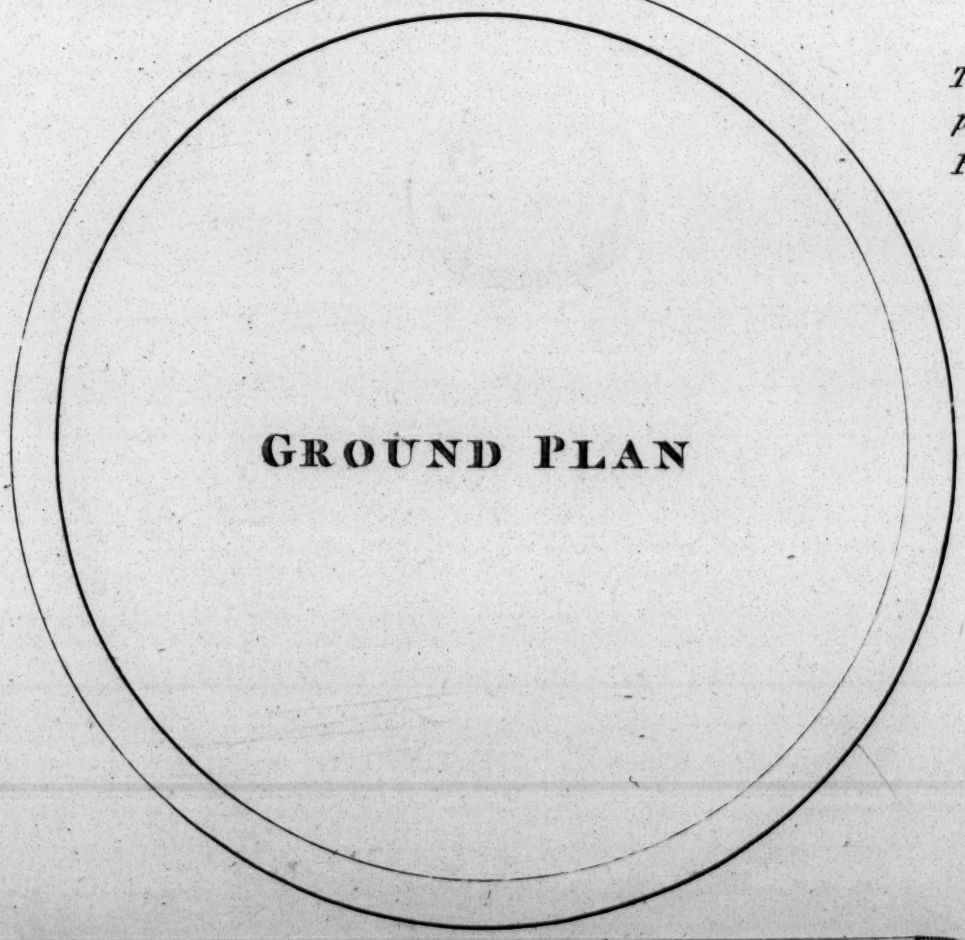
* If there are, as it is said, 20,000, or even 10,000, large barns in the kingdom, which must cost at an average £200. each, and if grain to the amount of £10. or even £5. is destroyed in each barn, the total expence and loss to the public, must be very considerable indeed. The expence of the erecting such a stand as in the annexed plate, is about £16. 9*s*. reckoning the bricks to cost on the spot, 31*s*. 6*d*. per thousand, lime 9*d*. per bushel, and oak timber 2*s*. per foot in the tree.

Plate XXXIII

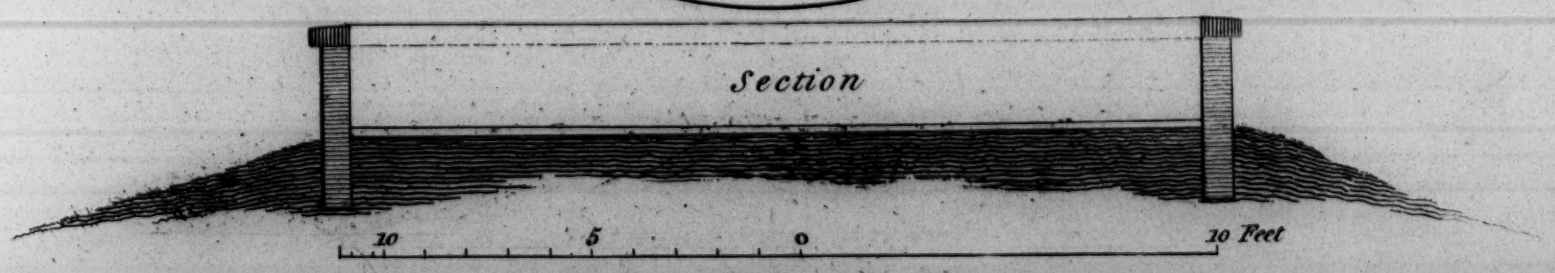
ELEVATION of CORN STANDS

at Woburn Abbey. Vide Page 72





The Walls of Brick, Kirb of Oak projecting 5½ Inches. the Bottom Paved with Bricks.



Neele sculp.t Strand.

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both for the walls and the coping. If it is apprehended, that any vermin can come through the bottom of the stand, slate might be made use of, through which, from its peculiar texture, they cannot penetrate.

It would be injustice to the noble Duke, at whose farm I observed these stands, not to take this opportunity of stating, that a variety of agricultural experiments, and improvements of various sorts, are carrying on at Woburn, under his immediate direction, not only with much zeal, but also with a degree of judgment, rarely to be equalled; the result of which, as soon as they are perfected, will, I hope, be brought under the consideration of the Board; and afterwards, through the medium of some of its printed papers, communicated to the public.*

* Some recommend the *Dutch barns*, as they are called, for grain as well as hay; and the posts certainly enable the stacks to be built very regularly, and any quantity wanted, may be taken in at a time, from the convenient form of the cover, without any risk of injury to the remainder. But corn stands, like those at Woburn, may be made of any size, in proportion to the thrashing barn, and a tarpawling, which no farmer should want, will be a sufficient protection to any part of a stack, which, by any sudden change of weather, could not be taken in.

COMMUNICATIONS

TO THE

BOARD OF AGRICULTURE.

ON

COTTAGES.

PART II.

COTTAGES.

V. *Letter from the Earl of* Winchilsea, *to the President of the Board of Agriculture, on the Advantages of Cottagers renting Land.**

SIR, South-Street, January 4, 1796.

AT your request, I made what inquiries I could, during the short time I was in the country, as to the situation of labourers renting small quantities of land; and am more and more confirmed in the opinion I have long had, that nothing is so beneficial, both to them and to the land-owners, as their having land to be occupied either for the keeping of cows, or as gardens, according to circumstances.

By means of these advantages, the labourers and their families live better, and are consequently more fit to endure labour; it makes them more contented and more attached to their situation, and it gives them a sort of independence, which makes them set a higher value upon their character. In the neighbourhood in which I live, men so circumstanced, are almost always considered as the most to be depended upon and trusted: the possessing a little property certainly gives a spur to industry; as a proof of this, it has almost always happened to me, that when a labourer has obtained a cow, and land sufficient to maintain her, the first thing he has thought of, has been, how he could save money enough to buy another; and I have almost always had applications for more land from those people so circumstanced. There are several labourers in my neighbourhood, who have got on in that manner, till they now keep

* This very valuable paper was drawn up at the request of the President of the Board of Agriculture, in consequence of a conversation which passed at the Farmers' Club; when the Earl of Winchilsea stated that the custom of letting small portions of land to labourers, which prevailed in parts of Rutlandshire, was found to be of great general utility. Sir John Sinclair then desired that Lord Winchilsea would inform him of all the particulars he was acquainted with, respecting that custom; which being read at the Board of Agriculture, and much approved of, was ordered to be printed. The following interesting communications, also, from Lord Brownlow, from Robert Barclay, Esq. M. P. and from Mr. Crutchley, of Burleigh, originated in the same circumstance.

two, three, and some four cows, and yet are amongst the hardest working men in the country, and the best labourers. I believe there are from seventy to eighty labourers upon my estate in Rutland, who keep from one to four cows each; and I have always heard that they are hard working industrious men; they manage their land well, and always pay their rent.

With regard to the profit they make of a cow, I am informed that those who manage well, will clear about twenty-pence a week, or £4. 6*s*. 8*d*. per ann. by each cow, supposing the rent of the land, levies, expences of hay-making, &c. to cost them £4. exclusive of house rent; this is calculated, supposing all the produce sold; but whether this is too low, or how it is, I cannot say; but certainly those who have a cow, appear to be (in comparison with those who have none) much more than twenty-pence per week richer: it may be owing to the superior industry of those families. I must observe, that they keep sheep during the winter upon their cow pasture, at the rate of two, and in some cases three, at 2*s*. 6*d*. each for each cow pasture. This is included in the above estimate of profit: the skim-milk is also valued. Some of them, where the land is not good, do not pay so much. I put down £4. supposing the land tolerably good, and it is certainly more advantageous to them to occupy good land at a high rent, than poor land at a low one. They all agree, that two cows are more than twice as profitable as one, particularly where the suckling of calves is the system pursued. The generality of the people near me suckle calves; some make butter, and a few make cheese; some buy the supernumerary lambs of the farmers, and rear them by hand; and where they have more than one or two cow-gaits, stock with sheep at the rate, in summer, of three for a cow-gait. Those who have families, and one cow, generally make butter, for the sake of having skim-milk for their children, which is an article rarely to be obtained by the poor. When a labourer has the offer of a cow-gait, and land for winter provision, and has not money enough to purchase a cow, he generally applies to his employer, who will in all probability advance him some money; and the inhabitants of the parish, if the man has a good character, frequently subscribe to set him up, from charitable motives, and from a persuasion that by this means his family will never want relief from the parish: and this is so much the case, that when a labourer dies, and his son takes his land and stock, he in some cases maintains the widow. I know of several instances of labourers' widows who are past work, who are maintained by their sons, who could not otherwise have lived without parish relief. In a village near me, where there

are a great number of labourers who keep cows, the poor's rate is not at this time above six-pence in the pound: the number of inhabitants 335.

When a poor man's cow dies, it is certainly a great distress, and sometimes the owner is obliged to ask assistance to replace her, and somehow or other they always contrive to get one, as I scarcely ever knew a cow-gait given up for want of ability to obtain a cow, except in the case of old and infirm women, who are left without children: they (unless they have some assistance from the parish), cannot live upon the profits of a cow, nor can they manage it properly. Should a case of this sort occur, the parish officers would act very unwisely in refusing assistance, as a very trifling allowance, together with the cow, would enable a woman to live; whereas, by refusing any assistance, they oblige the woman to part with her cow, and then she must have her whole subsistence from them. I applied to Mr. Barker of Lyndon, Rutland, for some information, with regard to the antiquity of the custom in that county, of letting cow-gaits to labourers, and received the following letter from him.

My Lord, Lyndon, January 14, 1796.

I have considered your Lordship's question as to the labourers keeping cows, and think it is certainly a very useful thing for them to do so; most of the poor people of this parish do keep cows, one, or two, or three to a family, and a great advantage it is to them; so that we can hardly say there are any industrious persons here who are really poor, as they are in some places where they have not that advantage. It has been the practice in this place time out of mind. We have a ground called the Cottagers' Close, wherein the poor, for an easy rent, keep eighteen cows, and, I suppose, it was laid out for them at the inclosure of the lordship in 1624.

On that close the cows go from Mayday till St. Andrew's, and in winter they take them into their homesteads; and while several neighbouring lordships were open-field, they could buy hay reasonably to feed them with at that season; and we have several little takes of a few pounds a year, rented by the cottagers; and I have made some new ones; for since the inclosure of those parishes, hay is grown very dear, and is scarcely to be had at all.

I believe it always was the custom for every one to keep a milch cow, who could raise money enough to buy one, and could get keeping for it. I imagine it was so

in this parish long before it was inclosed.—I think there are cottagers who have a right of a common in Hambledon cow-pasture; but your Lordship must know that matter much better than I do. There are little estates and cottagers who have a right of common in North Luffenham cow-pasture. There were persons at Edith Weston who had such before the inclosure, and I believe it was the same in other towns also; but I am sorry to say, that I am afraid most of those cottages were taken away at the time of the several inclosures, and the land thrown to the farms; wherein I think they did very wrong: but we have an instance of a new inclosure, where that good old custom is still retained; for Sir John Rushout has made a considerable number at Ketton. I believe the cow-pasture and ploughing land to each cottage is four acres. I wish, and I have often said so, that parliament would make it a rule never to grant an inclosure, without a close laid out for the benefit of the poor. I am, &c. THOMAS BARKER.

I can add to this, that upon my own estate, the custom is, I believe, of the greatest antiquity: I have labourers, tenants, in whose families the lands they now occupy have been for near two hundred years; and they have, as far as I can learn, been generally good labourers, and received no relief from the parish. I have made several new takes of that sort, and have always found them to answer.

With regard to manuring their meadow ground; by keeping their cows in hovel during winter, and by keeping a pig or two, which they generally do, they contrive to make manure; their employer generally sells to them, or gives them, a small quantity of straw, and sometimes they procure fern, or collect weeds.

The situation of labourers may, I think, be classed as follows:

1st. Those who have a sufficient quantity of grass inclosed land to enable them to keep one or more cows winter and summer, and a garden near their house.

This is, in my opinion, the best situation for a labourer, as, except the hay-making, the rest of the business is done by his wife, and his labour is not interrupted. Where a grass field is allotted to a certain number, and each have a field for mowing near their house; or where there are two fields, one grazed, and one mown alternately, and properly stinted, it will be as advantageous, or nearly so, as having small inclosures to themselves.

This can only take place in countries where there is an abundance of grass-land.

2dly. Those who have a summer pasture for their cow, and some arable land, upon which they grow the winter provision.

This is not so advantageous as No. 1. because more of their time is taken up by the arable land; however, as they must, in order to make any hay, have part of the land sown with grass, the labour is not so much as to be hurtful to them. I have several such upon my estate, which answer very well. This is adapted to countries where there is a mixture of pasture and arable.

3dly. Those who have a right of common for the summer-keep of the cow, and a meadow, or arable ground, or a meadow in common, for the winter provision.

This would be like the two former, were it not that nine commons out of ten are so much overstocked, that the summer-keep is very bad. This is a very great loss, and if the meadow is in common, it is another disadvantage. It is certain that upon an inclosure, if the owners choose it, the labourers who keep cows may be placed in a much better situation than they were, inasmuch as inclosed land is more valuable to occupiers of every description, than commons and open fields. Garden ground may also be allotted to them, and others, which cannot be done while the land remains uninclosed. I am persuaded, that where these things are attended to, very few objections to an inclosure will arise on the part of the labourers, and that the land owners will have the satisfaction of benefiting the poor, and at the same time of making their own property more valuable, by adopting what, in all probability, will be the means of keeping down the poor's rate.

I suppose gardens near the houses to all these; should not that be the case, as they have land, they may raise garden-stuff; but if their land is at a distance from their houses, it is not so advantageous: and if their take is all grass, they can find no ground to dig, except, perhaps, where a haystack has been placed the preceding year.

4th. Those who have a right of common and a garden.

This is certainly very beneficial to them: geese and pigs may be kept upon the common; and the latter fed with the produce of the garden, and a small quantity of purchased food.

5th. Those who have a right of common, and no garden.

This, unless fuel is obtained, is of no great value to them; if fuel is obtained, it is of great value, and the loss of it difficult to be made up to them.

6th. Those who have several acres of arable land, and no summer pasturage for a cow.

This is, I believe, of no sort of use to the labourer; for though he may cultivate part of the land as a garden, the continued labour it would require to stall-feed a cow winter and summer, and the quantity of the land he must till, would occupy so much of his time, that the take would, upon the whole, be injurious to him, even supposing

the land inclosed, and contiguous to his house: if at a distance, or not inclosed, the disadvantage would be still greater. I am sorry to differ in opinion upon this subject from Mr. Barclay;* but perhaps in other parts of the island, his plan of a take entirely arable might answer. I am persuaded it would not in the parts I am acquainted with, and that the farmers would not sell them hay, which is a part of his plan. I believe that a summer pasture for the cows is absolutely necessary, to make it of advantage to the labourers who keep them.

7th. Those who have a garden near their house.

This is the best thing that can be done for labourers in arable countries, and where there are other reasons which prevent them from keeping cows.†

8th. Those who have no land whatever.

This is a very bad situation for a labourer to be placed in, both for his comfort, and for the education of his children. When a labourer is possessed of cattle, his children are taught early in life the necessity of taking care of them, and acquire some knowledge of their treatment; and if he has a garden, they learn to dig and weed, and their time is employed in useful industry; by which means they are more likely to acquire honest and industrious habits, than those who are bred up in the poverty and laziness we too often see; for I believe it is a certain fact, that extreme poverty begets idleness.

For these reasons, I am clearly of opinion, that the letting land to labourers is of great utility both to them, to the land owners, and to the community; for though in every village some idle people will be found, who are not fit to be entrusted with, or capable of receiving benefit from land, still the greater number will, and it may have the effect of making those industrious who would not otherwise have been so. When circumstances will admit of it, their having land enough to enable them to keep cows is the most desirable thing for them; but a very great part of the island will not, in my opinion, allow of that system's being pursued. Where there is hardly any thing but arable land, and also in the neighbourhood of large towns, the value of grass-land is

* See No. VII. p. 91, where Mr. Barclay's opinion is stated.

† As land cultivated as a garden will produce a greater quantity of food for man than in any other way, and as four-fifths of the labour bestowed upon their gardens will be done by the labourers at extra hours, and when they and their children would otherwise be unemployed, it may not be too much to say, that 100,000 acres allotted to cottagers as garden ground, will give a produce equal to what 150,000 acres cultivated in the ordinary way would give, and that without occupying more of the time they would otherwise give to the farmers who employ them, than the cultivation of 20,000 acres would require.

too great to allow of labourers renting it with advantage; a garden may, however, be allotted to them in almost every situation, and will be found of infinite use to them. In countries where it has never been the custom for labourers to keep cows, it would be very difficult to introduce it; but where no gardens have been annexed to the cottages, it is sufficient to give the ground, and the labourer is sure to know what to do with it, and will reap an immediate benefit from it. Of this I have had experience in several places, particularly in two parishes near Newport Pagnell, Bucks, where there never had been any gardens annexed to the labourers' houses, and where, upon land being allotted to them, they all, without a single exception, cultivated their gardens extremely well, and profess receiving the greatest benefit from them. I beg to observe, that when I mention cow pastures, I always suppose there to be a sufficiency of land to enable the cow to be kept tolerably well both in summer and winter; if that is not the case, I believe that the cow is but of little benefit to the owner; and when I mention gardens, I always mean large gardens, from half a rood to a rood, or more, if the land is poor.—Those very small spots of a few square yards, which we sometimes see near cottages, I can hardly call gardens: I think there should be as much as will produce all the garden-stuff the family consumes, and enough for a pig, with the addition of a little meal. I think they ought to pay the same rent that a farmer would pay for the land, and no more. I am persuaded that it frequently happens that a labourer lives in a house at twenty or thirty shillings a year rent, which he is unable to pay; to which, if a garden of a rood was added, for which he would have to pay five or ten shillings a year more, that he would be enabled, by the profit he would derive from the garden, to pay the rent of the house, &c. with great advantage to himself.

As I before mentioned, some difficulties may occur in establishing the custom of labourers keeping cows in those parts of the country where no such custom has existed; wherever it has or does exist, it ought by all means to be encouraged, and not suffered to fall into disuse, as has been the case to a great degree in the midland counties, one of the causes of which I apprehend to be, the dislike the generality of farmers have to seeing the labourers rent any land. Perhaps one of their reasons for disliking this is, that the land, if not occupied by the labourers, would fall to their own share; and another, I am afraid, is, that they rather wish to have the labourers more dependent upon them, for which reasons they are always desirous of hiring the house and land occupied by a labourer, under pretence, that by that means the landlord will be secure of his rent, and that they will keep the house in repair. This the

agents of estates are too apt to give into, as they find it much less trouble to meet six than sixty tenants at a rent-day, and by this means avoid the being sometimes obliged to hear the wants and complaints of the poor: all parties, therefore, join in persuading the landlord, who, it is natural to suppose (unless he has time and inclination to investigate the matter very closely), will agree to this their plan, from the manner in which it comes recommended to him; and it is in this manner that the labourers have been dispossessed of their cow pastures in various parts of the midland counties. The moment the farmer obtains his wish, he takes every particle of the land to himself, and relets the house to the labourer, who by this means is rendered miserable, the poor's rate increased, the value of the estate to the land-owner diminished, and the house suffered to go to decay; which, when once fallen, the tenant will never rebuild, but the landlord must, at a considerable expence. Whoever travels through the midland counties, and will take the trouble of inquiring, will generally receive for answer, that formerly there were a great many cottagers who kept cows, but that the land is now thrown to the farmers; and if he inquires still further, he will find, that in those parishes the poor's rates have increased in an amazing degree, more than according to the average rise throughout England. It is to be hoped, that as the quantity of land required for gardens is very small, it will not excite the jealousy of the farmers.

I must, however, say, that I do by no means allude to all farmers, or all agents of estates; for I can with truth say, that I know a great many farmers who are convinced of the utility of letting land to labourers, and who have voluntarily given up land to be applied to that purpose, notwithstanding they had leases; and I also have the pleasure of being acquainted with agents of estates, who have the most proper and liberal ideas upon these subjects. I cannot conclude without expressing my hearty wish for the success of the General Inclosure Bill which you are now framing, particularly as I know that it is your wish and intention carefully to guard the rights of the cottager, and to consult the interest of the labourer. By the attention of the legislature, a great deal may be done; but still an infinite deal more must depend upon the proprietors of estates. I therefore hope that some more able advocate than I am, will plead the cause of the labourers, that all the land owners in the island may be convinced of the necessity of attending to the comfort and happiness of those most useful members of society.

I have the honour to be, Sir,

Your most obedient and humble servant,

WINCHILSEA.

Sir John Sinclair, Bart.

&c. &c. &c.

VI. *Queries concerning Cottages. With the Answers; by Lord* Brownlow.

Sir,

To the queries concerning cottages, which I had the honour to receive from you, I would sooner have returned an answer, if I had gone into the country during the recess at Christmas; but, as I continued in town, I was obliged to correspond upon this subject, together with many other matters, with my steward in the country.

In the parish of Belton, there has been, for a great length of time, a cottager's pasture, consisting of 159 acres, about half of which is covered with gorse; and the tenants of almost all the small houses have a right, for each house, to turn on this common, for the whole year, except from Ladyday to Mayday (during which time the common is to be free from stock), two horses, or four cows, or sixteen barren sheep, or twelve ewes and their lambs. No bullock or steer to be turned on except between Martinmas and Ladyday. A mare and foal equal to three cows, the foals and also the lambs to be taken off the 15th of August. Thirteen out of the twenty-five cottagers stock the common themselves, but the other twelve let their rights to the farmers, who are very ready to hire them at a price equal at least to what they pay for house and commons. The cottagers have a right to cut an equal share of gorse, as marked out by a person agreed upon for that purpose by the whole number. For the house, which mostly contains an oven, and to which there is always a piece for a garden, and a pig-sty, together with this right of common, the rent paid is thirty-five shillings per annum, I doing all repairs but glass windows; this is the same rent as has been paid for more than a hundred years; except that I have added five shillings per annum for the repairs of thatch, &c. which the cottagers used to do; for without so doing I perceived my cottages would come to ruin. But when I say the rent is the old one, I must also state, that I have added several cottages to the old number, who share equally in the common. The cottagers in the parish of Belton have, besides this pasture, a power of adjisting their cows in the park there, at eighteen shillings per head from old Mayday to new Michaelmas day: and many of them have a close of three or four acres at the least, for cutting hay; but no cottager has any ploughed land whatever.

On all my estates in Lincolnshire I have found a number of small tenants and of cottagers; and well knowing and esteeming the following rule of my father's "*rather build two cottages than suffer one to be annihilated*;" in new inclosures I have provided for all the little tenants, either by two cottagers' pastures, one for hay, the other for pasture alternately (as in the case of Welton about five miles north of Lincoln) or else have allotted them a close to the cottage. My present steward contrasts these different methods in the following words, "In cottage pastures, as at Welton, there is no power for the good manager to make the most of his land, the fences become neglected, and the land badly drained; many of the cottagers must lie at a distance from the pasture, they thereby use a great deal of time in foddering and milking, which would be valuable both to the farmers and themselves, especially in hay and corn harvest: whereas if each cottager has a close contiguously allotted to him, or even shares one with his neighbour, he contrives to raise a few lambs, and makes a profit that way as well as from his cow." I am a great advocate for grassland, with a comfortable house to a cottager, as the labourer then becomes attached to the spot, and interested in the peace and welfare of the country; but to let plough land to a cottager, I think wrong; because the land is ill managed, they must hire their ploughing, and it takes up so much of their time, that they will not go to labourer's work at the times the farmers most want them; being, as I have often heard them say, better employed about their own business, which if they neglected, they lost more than their earnings as labourers.

To the mode of letting small closes with cottages there seems, however, two objections, first the loss of land, and the expence from so many division fences; this may be made amends for to the land owner, if not by rent, at least by the satisfaction of giving more happiness both in degree and number, than he could give any other way; the second objection which occurs is the decay of the pasture for want of tillage in a course of years; but that perhaps may be obviated by having a small close or two more than the number of cottages, so that in succession each cottager may have his close in tillage, for a meliorating course of crops, during which time he would hold the spare close also for the support of his cow.

A tenant of mine in Lincolnshire, who has distinguished himself by his industry and good management, has another mode of providing for cottagers, upon an estate of which he is the steward; and that is, by requiring the farmers to keep a cow the year round for each of the cottagers, for three pounds: and in the cottages which

he has built on that estate, he has contrived to give between every two, a power of fixing a copper for brewing, &c.

The following are the best answers I am able to give to your several queries in their order.

QUERIES.

No. 1. What is the rent of the cottage merely?

2. To whom are they let?

3. What is the quantity of land allowed for a garden?

4. What is the rent of a cottage with such garden?

5. What the most profitable culture of it?

6. What quantity of land is, at an average, allowed for a cow?

7. At what rent per acre?

8. Which is found the best system to let each cottager; a separate field, or a number of them a large field for summer grass, and another for hay?

9. What quantity of hay per cow, do they require for winter?

10. How do the cottagers manure their land for hay?

11. What other profit, from sheep, or otherwise, do they derive from the land?

12. Do they raise any artificial grasses?

13. Will this system do for tillage? In what cases would it do, and how is the land to be ploughed?

14. Is a large garden as profitable to a cottager as a cow pasture?

ANSWERS.

No. 1. The rent of the cottage merely, is from 1*l.* 10*s.* to 2*l.*

2. In many parishes the cottages are very generally let to under tenants by the farmers; but this is a practice universally rejected on my estates.

3. A garden should not be less than a rood, exclusive of the pig-yard.

4. Rent of cottage with such a garden 2*l.* 10*s.*

5. By manuring for potatoes, after which crop, beans, peas, &c. will follow well.

6. Two acres and a half of land will be sufficient.

7. Value about 15*s.* per acre.

8. Answered by what has been said in the previous statement.

9. Two ton or two ton and a half, is sufficient for winter keep of one cow.

10. By the manure from the pig-yard, &c. or if the cow be housed (which is the best method) by the manure from thence.

11. They do derive a profit from keeping lambs from the time of their falling to Michaelmas, or later, when they are sold at the fairs.

12. Cottagers in some open fields raise clover.

13. The system of cottagers does not do well for tillage, for the reasons in the previous statement.

14. A large garden cannot be as profitable to a cottager as a cow pasture. In the first place he cannot maintain a cow from it: in the next, he cannot cultivate it without giving to it a great deal of his time, and more manure

than he can furnish of his own; for both which he would be ill repaid by the produce, over and above the consumption of his family. But without some garden, it must be difficult for a cottager to support himself and family; the size of it should be proportioned to the assistance he may get from his family, in addition to his own spare time of cultivating it.

15. When cottagers rent land, and keep a cow, has it the effect of raising or lowering the rate of wages?

15. It is thought not to raise the price of wages; by encouraging population it increases the number of hands, and a cottager who has such ties to the spot, can and will work for less wages than a labourer can, who has nothing but his wages for his support.

16. What are the effects of the system, to the cottager, the parish, and the public?

16. To the cottager it affords the comforts of life; to the parish it lowers the poor's rates; a man who keeps a cow has seldom been known to be troublesome to a parish; and to the public it gives an increase of hands, from infancy taught to work by their parents for their advantage.

17. What is found to be the best term,—life, lives, years, or at will?

17. The best term seems to be from year to year at will. If cottagers are upon lease for years or lives, they will be induced, by a small advantage, to work for neighbouring parishes, consequently their own landlord will lose the labour of his cottagers, and others will reap the benefit who have no cottages; which would be the greatest discouragement to erecting them.

18. What is the price of the cow?

18. The present price of a cow in my neighbourhood is from eight to ten pounds.

19. What in general is the quantity of milk, butter, or cheese, the value by suckling, &c.? or the total profit of each cow?

19. The quantity of milk, butter, and cheese, must depend on the sort both of cow and pasture: the value by suckling must also depend, I presume, on the time of year the calf drops; but in common the profits of a cow may be estimated at seven pounds per ann. In dairy farms, by the Trent side, the profits are reckoned from eight to ten pounds. If well managed, and near a market town, they are even more.

20. What is done if the cow dies?

20. A new cow may be purchased partly from

G.R III.
BRITISH MUSEUM

Plan of a Cottage; as recommended by Lᵈ. Brownlow.

See Page 89.

Fig. 1

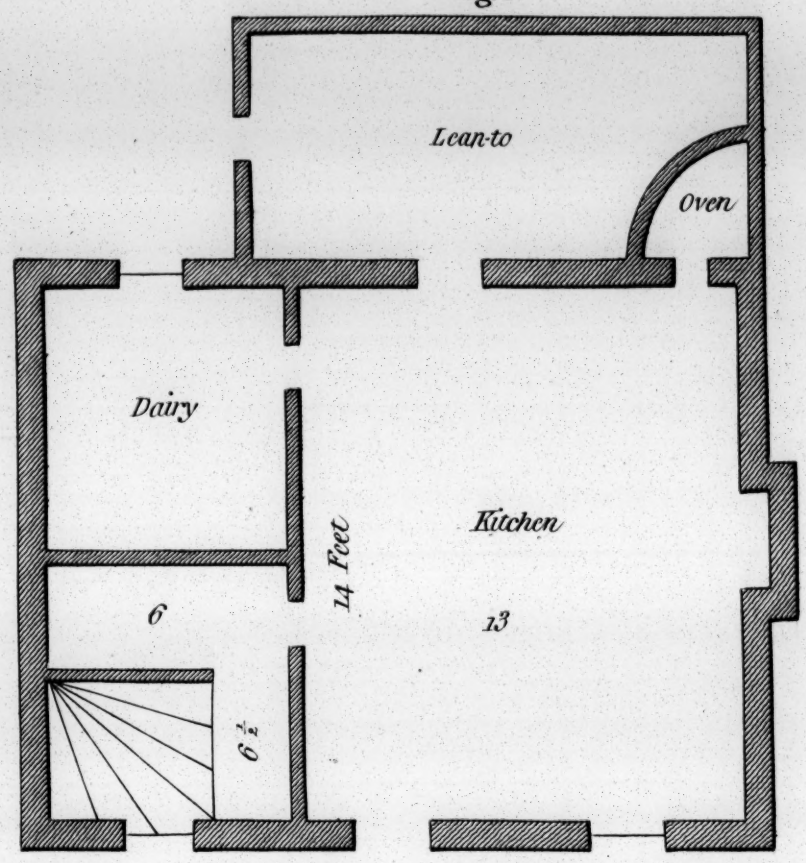
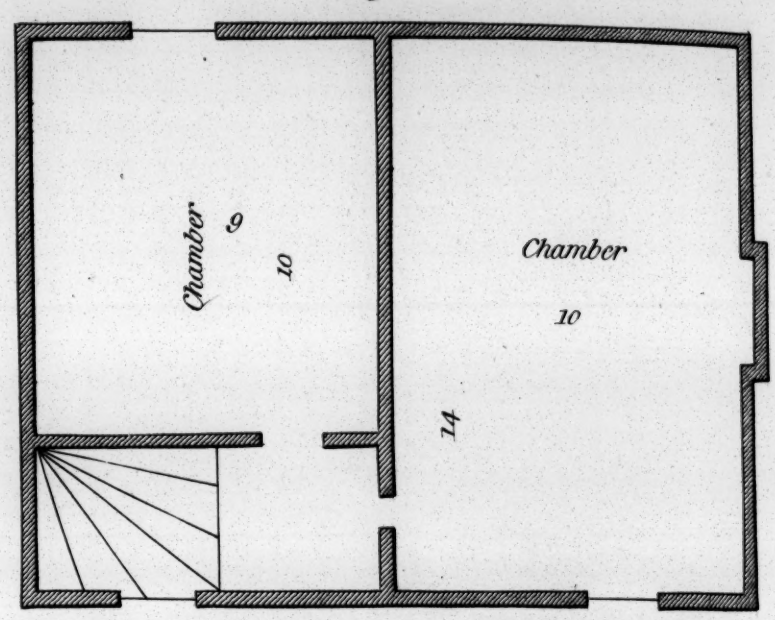


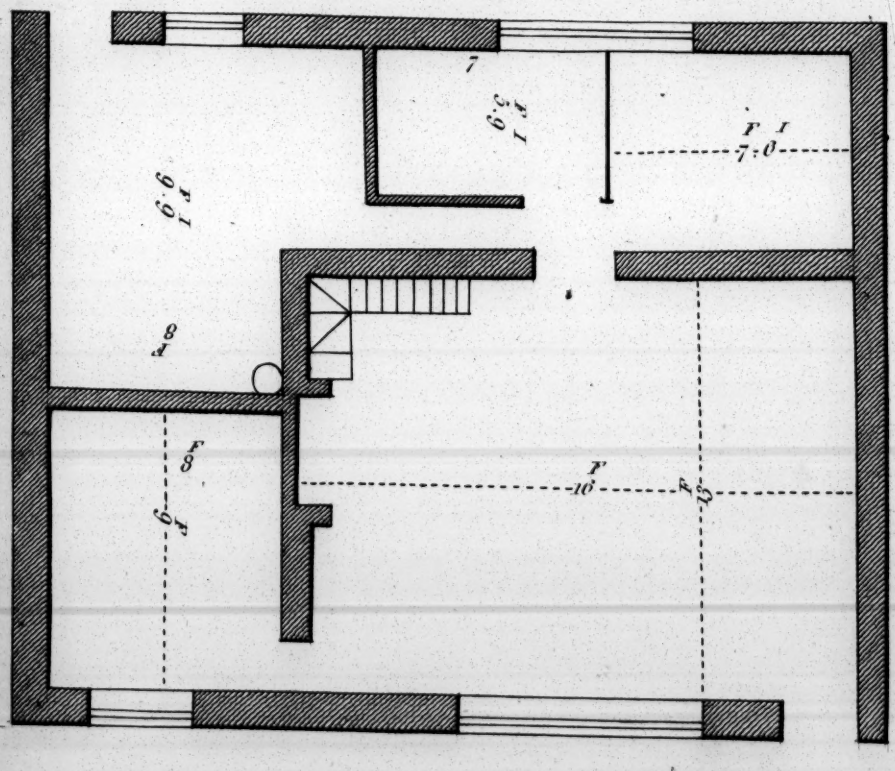
Fig. 2

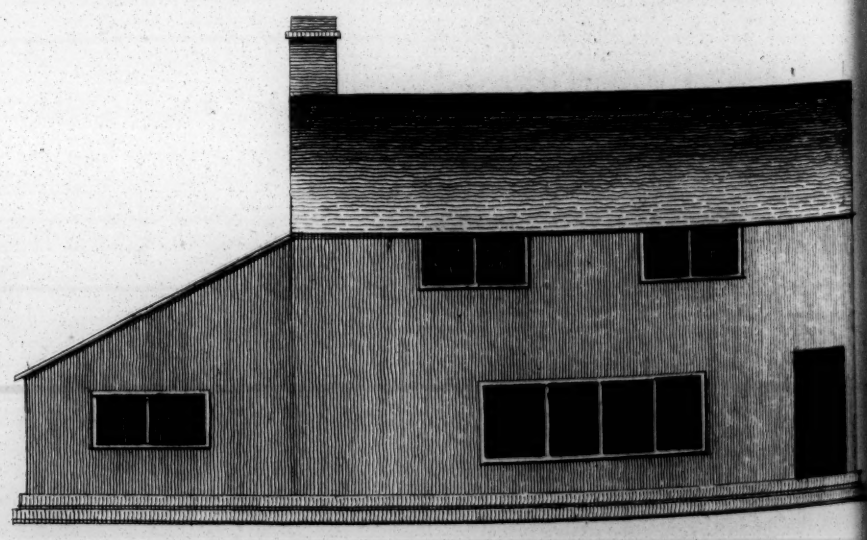


The Chambers are partly in the Roof $\frac{ch}{w}$ is not Hipped but with Gabble ends, the Windows of the Chambers do not break the Roof being up to the Plate but not higher.

Plan of a Cottage, as recommended by Mr Crutchley.

See page 96.





Neele sculpt. Strand

past profits, and partly from gathering amongst the neighbours; this pretence to ask charity has been known to be often abused, by begging all over the country, and treble the value of the departed cow obtained.

21. How is the produce sold? is it carried weekly to market?

21. The produce is brought weekly to market, sometimes at more cost of labour and loss of time than the commodity is worth; but butter and cheese may always be sold by cottagers to shops in their own or neighbouring villages.

22. How long has this practice been established?

22. In all open field lordships there have always been pastures in which the cottagers have had their share of benefit; but the practice of enabling cottagers to keep cows in inclosed parishes, is in my neighbourhood rare, and of a recent date.

23. Do they keep pigs? When they do, with what profit?

23. A cottager who keeps a cow always keeps a pig or two; the profit from thence is very considerable, as a pig is maintained, except when fatting, by what would else be thrown away; and a pig bought for 20*s.* at Midsummer, will be worth 3*l.* at Christmas.

24. What is the best form of a cottage?

24. The plan (Plate XXXIV. fig. 1, 2.) as most approving of it, is what I have last built upon. It is taken from Kent's Hints, p. 230, with a little alteration and addition. It is built with stone, covered with pan-tile.

25. What are the conveniences given for baking or brewing, and how disposed to serve several cottages?

25. An oven is built with almost every cottage, and the cottager sets a copper in the chimney corner, which answers for the purpose of brewing as well as washing.

26. What is the expence of building?

26. Expence of building such cottages is estimated in Kent's Hints; but as the common woods, such as elm, lime, and ash, which are often suffered to stand upon estates till they decay, answer for such buildings, the actual expence of building might be less than stated by that author; the amount of which for two cottages built together is 140*l.*; but he does not include pig-sty, or hovel for fuel and cow occasionally.

27. How repaired?

27. By the landlord, or else they will soon go to decay.

For whatever may be defective in the above answers, or for any fresh queries, if such arise, to which I can give or procure answers, it will be the highest gratification to me to be honoured with your commands; for of all things, the system of cottages is that in which I feel the greatest interest, being thoroughly convinced, that there subsists the closest connection of interest between the cottager and the land-owner.

I have the honour to be, Sir,

22 February, 1796. Your most obedient servant,

BROWNLOW.

To Sir John Sinclair, Bart.
President of the Board of Agriculture.

VII. *On Labourers in Husbandry renting Land.* *By* Robert Barclay, *Esq. of Urie, M. P.*

It certainly is of great moment, to find some method to enable country labourers to live more comfortably than they do at present, by placing them in a situation where they may acquire some property and subsistence, when they become old, and unable to perform hard work, and that they may not be so subjected to the difficulties which they now undergo in times of scarcity, nor become a burden upon the parishes where they reside; likewise that they may be enabled to keep cows for the nourishment of their children.

Labourers may be divided into two classes, the first of which I shall term *labourers by the piece*; I mean such as work at hedging, draining, hoeing of turnips, cutting hay, and at harvest work; the second class I shall call *labourers by the day*; these are constantly employed by the farmers at ploughing, and other works which require regular attendance.

The first class being only hired occasionally, are employed by different farmers, according to circumstances. These, I think, may have a small portion of tillage land (for which they can afford to pay a reasonable rent), perhaps two and a half acres, divided into five parts (I suppose turnip land); or two acres divided into four parts, or they may have four or five acres, if that quantity shall be thought eligible; I mention a division into *four* and of *five* parts, because in some soils clover remains one season only, in that case the land must be divided into four parts; in other soils it will continue vigorous for two years; the best division in that case is into five parts. In the course of four crops, turnips, barley, clover, and wheat, is the best mode of cropping. In the other case, turnips, barley, clover and a little ryegrass mixed with it, will answer better. The clover may remain two years, and then be ploughed up for wheat. In either case, as soon as the wheat is carried home, the stubbles should be chopped and drove to the farmyard. The land, or part of it, should be immediately ploughed, and sown with rye mixed with winter vetches; these will answer for the cows till the middle or end of July. Then the ground should be ploughed two or three times, and sown with turnips; these will answer well the succeeding spring; and by sowing a part of the land with rye and vetches, which has borne a crop

of wheat, the greatest part of the clover can be made into hay, which with turnips, cabbages, &c. that may be raised in the hoed division; will abundantly serve their cows in the winter. To make these courses more intelligible, I have mentioned turnips as the only hoed crop, but I think such labourers ought not to have a garden. A part of the hoed division may be planted with cabbages, potatoes, coleworts, &c. and the remainder sown with carrots and turnips; this substitute will fully answer the purposes of a garden, and will plentifully supply their families with vegetables. Each of these labourers must have a thrashing-floor, and a place for his cow both in winter and in summer. The small portions of land which I have mentioned will not admit of divisions for them to pasture upon. Such labourers being extremely useful to the farmers, will not, I think, find much difficulty in getting their lands ploughed, &c.; I am aware that in some soils clover sown three or four times, in the courses which I have mentioned, will at last fail; if that shall happen to be the case, the manner of cropping must in a small degree be varied. Half of the land which has produced barley the preceding year, may be sown with vetches instead of clover. The same half will, in the next course, produce good clover. This expedient has, in several instances, answered.

The second class of labourers are constantly employed in the service of the farmers, and cannot bestow that attention which is necessary for the management of tillage land; I therefore think it is out of the question for them to have any; I propose that every labourer of that description shall have the eighth of an acre for a garden; and for enabling him to keep a cow in the summer, there may be a pasture field near the cottages. The farmer who employs him, ought to sell hay to him at a moderate price, for the purpose of keeping his cow in the winter. A hovel may be erected for her in some part of the field, or near the cottage, where her *dung* can be collected, which may be given to the farmer. This advantage will lessen the price of hay to the cottager, the refuse of his milk and his garden will enable him to keep a hog, the dung of which, with the ashes, &c. will manure his garden. Rich land, such as Lord Winchilsea's, may be pasture, and cut for hay alternately; in that case the labourer can cut and make his own hay; but still he will be more useful to the farmer, if he shall purchase his hay from him, because then the labourer will be enabled to keep more closely by his work.

VIII. *Answers to the Queries respecting Cottagers renting Land. By Mr.* Crutchley *of Burleigh.*

QUERIES.

No. 1. What is the rent of the cottage merely?

2. To whom are they let?

3. What is the quantity of land allowed for a garden?

4. What is the rent of a cottage, with such garden?

5. What is the most profitable culture of it?

6. What quantity of land is, at an average, allowed for a cow?

7. At what rent per acre?

8. Which is found the best system; to let each cottager a separate field, or a number of them a large field for summer grass, and another for hay?

ANSWERS.

No. 1. The rent of a cottage house is from twenty to twenty-five shillings a year.

2. Generally to the cottager himself.

3. The quantity of land for a garden to grow potatoes for a family, and feed a pig, is from 25 perches to a rood; the first two years the whole is sown with potatoes. In a few parishes, if the garden contains a rood, the following mode of cropping has been lately adopted. The third year one half is sown with barley and clover, and remains two years before it is broke up again: then the other part is sown with barley and clover; and the crops after that time will be one half, two years potatoes: the other half, one year barley, and the other year clover; this mode of cultivating answers exceedingly well to the occupier.

4. The rent is in proportion to rent given by the farmers for land out of which the gardens are taken.

5. One half potatoes, the other half cabbage, carrots, and all other sort of vegetables; and so change alternately.

6. The quantity of land for a cow is about three acres, half of which is for pasturage for the summer, the other half for hay for winter keeping.

7. The above should be land worth 25 shillings per acre.

8. The best system is, for cottagers to have two large fields nearly of the same bigness, which should be mown and grazed alternately; but this mode cannot be adopted in old inclosures, therefore separate fields for some, and two or four fields for the other. Upon

new inclosures, the mode of two large fields for cottagers should be particularly attended to by men of property; and they ought to be very careful in dividing their estates into farms, so that small farmers and cottagers are not turned out of business; and I believe this is the only real complaint that is made against inclosing.

9. What quantity of hay per cow, do they require for winter?

9. The quantity of hay for a cow for the winter about one ton and a half.

10. How do the cottagers manure their land for hay?

10. Land, if mown every year, about one-fourth in a year is manured; so the whole will be manured in four years, this is dung made from the litter of the cow, calves, and pigs.

11. What other profit, from sheep, or otherwise, do they derive from the land?

11. The land that is pasture for the cow in the summer, two sheep are kept upon it in the winter; the profit arising from the sheep is five shillings, from the tenth of October to the fifth of April.

12. Do they raise any artificial grasses?

12. No.

13. Will this system do for tillage? In what cases would it do? and how is the land to be ploughed?

13. I am fearful it will not answer upon so small a scale.

14. Is a large garden as profitable to a cottager as a cow pasture?

14. No.

15. When cottagers rent land, and keep a cow, has it the effect of raising or lowering the rate of wages?

15. Wages are certainly not raised by labourers having land. I am persuaded they are, in fact, much lowered, if the wages were the same; as a more industrious set of men are employed in labour, and having more of the comforts of life, they are enabled to work harder than common labourers; by this more work is done for the same wages.

16. What are the effects of the system to the cottager, the parish, and the public?

16. The cottager, by which I mean a labourer who keeps a cow, enjoys these comforts of life, that a common labourer has it seldom in his power to procure, namely, milk, butter, cheese, and bacon, (the first of which is seldom to be bought). The difference between a cottager and a common labourer is so much, that I am at a loss for a comparison, except it be that of an opulent farmer to a cottager; where there are a number of them in any pa-

rish, the rates will be low. The public must be benefited by them, there being not a yard of waste land upon any of their premises to be found.

7. What is found to be the best term,—life, lives, years, or at will?

17. Tenants at will.

18. What is the price of the cow?

18. The price of the cow varies according to the value of the land it is kept upon. Land of twenty-five shillings per acre, the cow costs from seven to nine pounds.

19. What in general is the quantity of milk, butter, or cheese; the value by suckling, &c.? or the total profit of each cow?

19. Upon an average three pounds of butter for thirty-six weeks, will be collected from a cow. Valued at nine pence per pound, equal to - - £4 1 0

Skim milk for thirty-six weeks, at one shilling and sixpence per week - - 2 14 0

Calf at three days old - 15 0

7 10 0

Trouble and expences at market 1 0 0

£6 10 0

By suckling

Two calves ten weeks, each at four shillings per week - 4 0 0

One calf five weeks, at four shillings per week - - 1 0 0

£5 0 0

Consequently the profit of the cow for one year, by making butter, six pounds ten shillings; by suckling, five pounds.

20. What is done if the cow dies?

20. If the owner is not able to buy another, a subscription is entered into by the farmers and cottagers to buy one.

21. How is the produce sold; is it carried weekly to market?

21. If they feed calves, there is nothing to take to market; but if they make butter, it is carried to market weekly; and if cheese is made, it is carried to market when fit to eat.

22. How long has this practice been established?

22. In this county time immemorial.

23. Do they keep pigs? When they do, with what profit?

23. If a calf is not fed, the skim milk will keep two pigs, which keep will be worth eighteen pence per week.

24. What is the best form of a cottage?

24. The plan (Plate XXXIV. fig. 3, 4.) of a house, is thought by most cottagers to be the best, from the number of conveniences there are in it. But if this is built with mud walls, with all the little comforts, it will cost nearly forty pounds.

a, Living room.—*b*, Bed room, lean-to.—*c* Wash house and brewhouse, lean-to.—*d*, Dairy, lean-to.—*e*, Cellar and pantry, lean-to.

N. B. There are two sleeping rooms over the living room.

25. What are the conveniences given for baking or brewing? and how disposed to serve several cottagers?

25. A large oven is thought to be the best, and if a quantity of firing were laid in for baking, and paid for in proportion to the number in each family, would lower the expence by using less firing, and the bread much better baked than in a small oven.

The conveniences for brewing are set forth in the plan of the cottage.

26. What is the expence of building?

26. Expences of building a house, cow-house, and pig-sty, if mud walls, and thatched, about thirty pounds. Some owners of estates have been so good to build comfortable cottage houses, which cost from sixty to seventy pounds each, and have had the liberality to let them at one pound five shillings a year.

27. How repaired?

27. By the tenant.

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for " kitchen, and parlour, and all ;" it contains the only chimney in the house, which should be large, with a high mantle-piece, so as to admit of sitting under it ; the fire to be made on the hearth, and the chimney above the mantle large enough to hang meat or fish to dry. If an oven is required, the mouth of it should open through one of the jambs, and the body of the oven being in the house will have advantages which will be hereafter noticed. The size of the chimney should admit of a pot hanging over the fire, so large as to preclude the necessity of a copper, which, besides its cost, would add an unnecessary consumption of fuel. The division adjoining this room, marked B, serves for a cellar, pantry, dairy, &c. for which purposes it is better that the floor should be sunk about 16 inches, which will not prevent the run from the sink being made above ground, and directed towards the dunghill, or towards the necessary. The next division, marked C, is over the last, and is designed to be a lodging room for children ; and the last division, marked D, is designed to lodge the cottager and his wife. The quantity of ground which should be allotted to a cottage of this description admits of much speculation ; perhaps it should be regulated by the goodness of the soil, and by considering how much it may be possible for the cottager to cultivate, without injury to the claims of his employer, who purchases his daily labour, and has a right to nearly all that can be done.

3d. With respect to the superstructure, and the materials of which cottages should be built. Here again comfort should be considered ; and it will be found that economy and elegant simplicity go hand in hand : the great object is to make the cottage cool in summer, and warm in winter, and to effect this with as small a quantity of fuel as possible, which, perhaps, were it not for cooking, might be totally dispensed with. To obtain fuel, the inhabitants of cottages, as the case now stands, are driven by necessity into the lanes and woods to pick up sticks, driven to a pursuit that is often fatal to them, and always injurious to the neighbourhood. To avoid this necessity as much as possible, let the walls of the cottage, and the covering be thick enough ; the walls may be built of the earth or top soil, compressed in moulds,*

* This practice has lately been introduced into this country from France, where it is known by the name of Pisé. It consists of throwing the earth in a dry state, into moulds formed for the purpose, and compressing or ramming it together ; when it acquires such a solidity, that walls so made will support several stories, and the heaviest weights. The expence of this manner of building, will be seen in the estimate. Should this practice not be sufficiently known or understood, the common one of mud-walling is next to be preferred ; both kinds, and indeed the whole of buildings of this sort, should be executed between the ends of May and July.

and should be made at least 20 inches thick. The roof should be covered with thatch, on rafters of young fir, or poles of unsawn timber. Such a building well executed will last half a century, with no other repair than once covering the thatch; and it is obviously and unquestionably the cheapest, and in summer the coolest, and in winter the warmest building that can be erected. If it were necessary to secure such a building from fire, the method described by Lord Stanhope, in his paper read to the Royal Society on the 22d of July, 1778, would be efficacious; but if no more than two cottages join together, if there is not more than one chimney in each, and if there are no furnaces which occasion a strong draught through the fire, it is not probable an accident should happen. For the rest of the materials there needs no other direction, than that they should be the cheapest that offer. The flooring of the lower rooms might safely be of earth, the next best is paving of tiles or bricks; but wood or stone are the worst materials for the purpose. The flooring of the chambers being laid of boards, on what Lord Stanhope calls underflooring, would so far secure the building from fire, and prevent the necessity of any ceiling in the lower story. The sort of walling proposed admits of an outside colouring to imitate stone, which added to the soft and elegant simplicity that always attends good thatching, would make cottages one of the greatest ornaments to the country.

4th. The supply of water and fuel, and the application of fuel to the necessary purposes of the cottager and his family. Softness is an essential quality of water; hard water may be dispensed with, but soft cannot. Happy are the cottagers who live by the side of a running stream of soft clear water. Next to this, soft spring water is most desirable, and on failure of these advantages recourse must be had to rain water, preserved in tanks, which are covered over, and from which (to prevent the waste of a pump) the water is drawn up by a bucket. A tank 10 feet diameter, and 10 feet deep, arched over, would at an easy expence supply twenty cottages all the year round. The last and worst resources are deep wells, particulalry in clay soil, on which no human or animal being should be made to depend. Plenty of good water is necessary to health and cleanliness, it is therefore to be hoped that no cottages will be built, or be suffered to be built, where this cannot be had.

The next thing necessary to our existence, at least which habit has made us conceive to be so, is fuel, the economy of which, as applied to cottages, is exceedingly plain and simple. Construct the house properly, and a small quantity will do much. The great object to be kept in view is, that of the heat which arises from the fuel

consumed, none shall be suffered to escape without use, but that all shall be employed to some purpose or other. If the chimney is large, and the fire made on the hearth, the draught will be very small, and if the shaft of the chimney is continued five or six feet above the highest part of the roof (as was the case in all old buildings), the chimney will not smoke, nor will the air escaping at the top of the chimney convey with it more heat than is necessary to give a proper direction to the smoke. It was observed before, that when an oven is necessary, the body of it should be in the room. This will considerably add to its warmth, and a convenient lodgement for dry stores will be formed above the oven.

Estimate for the Design of one Cottage of the smallest Size.

Building cottages must be attended with more or less expence according to the facility with which materials can be procured, and the price of labour, and in some measure upon the foundation that may be required, and the labour necessary to form the level on which they are to stand; but supposing no extraordinary expence, the estimate will stand thus.

	£.	s.	d.
17 yards digging the foundation and levelling the ground, at 3*d.* per yd.	0	4	6
160 feet of reduced brick, rough stone, or flint, in the foundation, and one foot above ground, taking an average price, brick will probably be the dearest. When flint or rough stone is to be got, the least expence is to lay it in dry, and run liquid mortar, or as the workmen call it *grout*, to fill the interstices and cement the work. It was thus the old hard walls, of which great remains are still to be seen, were constructed; at 6*d.* per foot, 22 inches thick, - - -	4	0	0
170 feet of reduced brick work to the chimney and chimney shaft, at 8*d.* per foot, - - - -	5	13	4
608 feet superficial of earth or mud walling, 20 inches thick, at 3*d.* per foot, - - - -	7	12	1
1 sq. 66 ft. superficial of flooring to the kitchen, if of earth, at 5*s.* per sqr.	0	8	3
78 feet of flat brick paving, laid dry in the pantry at 3*d.* per foot,	0	19	6
11 ft. 3 inch. of chimney hearth paved with brick an edge in mortar, at 6*d.* per foot, - - - -	0	5	$7\frac{1}{2}$
Carried forward £.	19	3	$3\frac{1}{2}$

	£.	s.	d.
Brought forward	19	3	3½
33 feet of brick foundation to the privy, 9 inches thick, and two feet deep, open towards the dunghill, at 6*d.* per foot, -	0	16	6
15 feet cube in a small brick sink in the pantry, raised 2 feet 6 inches above the floor, the run from it to the yard and privy, at 9*d.* per foot,	0	11	3
16 feet run of brick gutter across the yard, at 3*d* per foot,	0	4	0
46 sqr.¾ of the best reed straw thatching on the house, including roofing of fir poles, or rough unsawn timber, prepared for thatching, at 40*s.* per sqr.	9	10	0
3 square of chamber flooring, timber and boards, at 45*s.*	6	15	0
3 square of underflooring, serving as a security against fire, and a ceiling below, at 20*s.* per square, - -	3	0	0
Mantle, tassels, and inside burn to kitchen chimney,	0	8	0
The staircase, one story, - - -	2	10	0
Three brick steps, with wood nosings from the kitchen to the pantry,	0	5	0
The street ledged door, lintels, locks, latch, hinges, and door-cases,	0	19	6
The inside linings to ditto, - -	0	4	0
* The ledged door, door-case, lintel, hook, hinges, bolt, latch, and inside linings, from the pantry to the yard, - -	1	0	0
The projection on the outside of the street door, intended to shelter it from wind and rain, of boarding covered with lead, -	1	6	0
No. 5. Inside ledged deal doors, hinges, latch, and jambs,	2	10	0
No. 4. Casement windows, solid frames, lintel, lead lights, and inside window boards, - - - -	4	12	0
Outside fall-down shutter and hinges to one window, fastened with a pin and key, - - -	0	6	0
Wood bars to secure the pantry window, - -	0	1	6
Outside painting to the window frames, doors, and shutter, -	1	10	0
Skirting in the kitchen and two lodging rooms, -	3	0	0
A dresser and two drawers in the kitchen, with a shelf over it,	2	10	0
Small dresser and shelf in the pantry, - -	0	7	6
Closet shelves, and two closet locks, - -	0	13	6
Carried forward	£. 62	3	0½

* This door may perhaps be dispensed with in cottages of the smallest size.

Brought forward	£.62	3	$0\frac{1}{2}$
Lath and plaster to the ceilings of the lodging rooms, and partitions,	1	5	0
Rendering against the walls in the kitchen only, -	0	15	0
The whitewashing in the inside, the colouring on the outside, and forming the rustics, - - -	2	2	0
Completing the privy above the brick foundation, and covering it with thatch, - - -	3	0	0
Building the hovel covered with thatch, inclosed three sides with slabs, leaving an opening (for pitching fuel or straw, &c.) next the street,	8	10	0
Fencing next the street, and small gate, &c. -	2	5	0
Total Estimate for one cottage,	£. 80	0	$0\frac{1}{2}$

The fencing to the garden, as well as making it, are not considered, as it must vary considerably in every situation. The supply of water is a sort of general concern, of which it is difficult to say how much will attach to a particular cottage.

This estimate is for a cottage of the smallest size. Perhaps buildings in the country may be thus divided, increasing in size and expence according to the order in which they are named:

Cottage, smallest size, for the labourer.

Second size, for the labouring man who by his skill, and working task work, earns more than the common labourer.

Cottage, third size, for the village shopkeeper, shoemaker, tailor, butcher, and baker.

Cottage, fourth size, for the farmer, maltster, small farmer, alehouse, and trades requiring room.

Cottage, fifth size, for the large farmer, generally called a farm house, suitable to the most improved system of farming, but nevertheless partaking of the general principles already laid down, the expence of all such buildings will depend not only on the facility of procuring labour and materials, but on the economy and management of those who direct, and those who undertake the construction of them. It is not the least merit of the proposed plan, that the cottages of the smallest may be executed with the refuse of greater works, the "crumbs from the rich man's table," and that the materials are nearly all neither taxed or taxable.

X. *On Cottages.* *By* Robert Beatson, *Esq.*

THERE is no subject better intitled to the attention of so respectable an institution as the Board of Agriculture, than the means of accommodating that useful and truly valuable description of persons, the labourers who are employed in husbandry. I shall therefore take the liberty of submitting to the consideration of the Board some observations on the advantages which the farmer may derive from having their aid in carrying on his operations, and on the construction of the cottages they inhabit.

Nothing is more ruinous to the interests of the farmer, than to keep a greater number of servants than he really has occasion for. Yet in all farms it is necessary there should be a fixed establishment of servants, in proportion to the extent and nature of the farm. Every one above that number, may be considered as a supernumerary, incurring an unnecessary expence of at least fifteen or twenty pounds per annum, which will fall very heavy on the profits of almost any farm. This fixed establishment, however, is by no means sufficient to carry on the whole operations of the farm at all seasons of the year. There are certain times and certain operations that require additional hands; and fortunate is the farmer, who can, on every such occasion, command a sufficient number to expedite and to accomplish his labours. It generally happens too, that when one farmer has occasion for a great many additional hands, all the other farmers in the neighbourhood have the same. How then are his operations, in this case, to be carried on? he must have hands, otherwise he cannot proceed, or at least may suffer a very material loss by delay.

There are only three sources from whence he can expect assistance: from townspeople, if near a town, from villagers, or from cottagers. The townsman considers himself totally independent of, and unconnected with the farmer, consequently whoever gives him the best price, that is, bribes him highest, will purchase his labour; but as it generally happens that those who will accept a bribe, are little to be depended on, high wages, a great bustle, and little work badly executed, are therefore too often the consequence of applying to that source. The villager is also independent of the farmer, although somewhat more connected with him than the townsman. His de-

mands, however, may not be so exorbitant, yet being more accustomed to country labour, he will, no doubt, be of more utility, if he can be prevailed on to give his assistance. But the cottager is the main resource upon which the farmer can best depend; if therefore he is fortunate enough to have several well peopled cottages upon his farm, he will have little to fear from a want of hands on extraordinary occasions.

A ready supply of labourers is not the only advantage a farmer may reap from cottagers. He will have, at an easy rate, all the manure they make, except what they themselves may require for their little gardens; and they will often, perhaps, be the purchasers of several commodities he may have to dispose of, and save him the trouble of carrying them to a more distant market. They will also sometimes have occasion for an additional quantity of ground besides their gardens, for which they will perhaps be enabled to give a better rent than even the farmer himself can make of it by keeping it in his own hands, or than can be expected from those at a distance; for, in general, land is the more valuable to the possessor, the nearer it is to his place of residence, and particularly so to the cottager, who can labour it at his spare hours, or when he is not otherwise employed.

A nation is said to be rich in proportion to its population. So it is in a great measure with an estate, or a farm, for the more numerous its inhabitants, the more easily will it be cultivated and improved. The erection of cottages is therefore an object of great importance to the farmer as well as to the proprietor; but it is necessary for the mutual advantage of both parties, that the landlord and his cottagers should be on the best of terms. That he should regard them as a part of his own family, and that they should look up to him as their best and surest friend and protector. Every cottager should therefore consider that in promoting the interests of his landlord, whether proprietor or tenant of the farm, he is, at the same time promoting his own; for a landlord has it much in his power to serve and oblige his cottagers in various ways, as they themselves must be sensible of. If therefore they show that attachment and preference to his interest, which he has a right to expect, there is no doubt he will do every thing he can to render their situation as comfortable as possible; but as it may sometimes happen, that even the favours he may do them, are not sufficiently binding on people of an ungrateful or refractory disposition, perhaps the most effectual way to secure to himself those benefits he is justly intitled to expect from their residence on his farm, would be to make his rents

conditional,* that is, in case they do not give their assistance, when wanted in harvest, or on any other pressing occasion, they should pay so much more, and the farmer or proprietor to have it in his option to remove them at the first term of Candlemas, or Whitsunday, at which time the produce of the preceding crop will probably be removed from the ground they occupy, and their successor will have time to prepare for the ensuing crop. If settled on some such terms as these, the farmer will find it greatly to his advantage, to have as many cottages on his farm as possible, and if he has a long lease, it would even be his interest to assist the proprietor in erecting new ones, either by driving the materials, or otherwise, as they can agree. In every spare corner therefore, if a dry situation, of easy access, well sheltered, and near good water, a cottage should be built, and every encouragement given that can render the cottager and his family happy and comfortable.

In many parts of the kingdom, one great obstacle at present in the way of settling cottagers, is the poor laws as they now stand. Every cottager and his family being supposed entitled to certain claims upon the parish, in which they reside; but this might perhaps be obviated by passing a law, enacting that in future, with certain exceptions and provisions, no cottager or others, shall be entitled to make any such claims; or it might even, in some degree, be fixed by agreement with the cottager, at the time of his taking the cottage, by his entering into an obligation for himself and his heirs to renounce all claims whatever upon the parish.

Such a law, or such an agreement might, in all probability, act as a sort of *stimulus* to industry, and might induce every father of a family, to exert himself, tomake some kind of provision for his children or widow, in case of his death. Whereas, at present, by far too many take no sort of pains whatever to do so, being prepossessed with the idea, that if reduced to beggary, the parish will provide for their families at their decease; and, trusting to the poor's funds, when often they have no occasion to do so, they squander away their little pittance at the alehouse, and dissipate all they earn as fast as they receive it.

By some such regulations as these this great obstacle towards erecting cottages

* At Mr. Bishton's, of Kilsal in Shropshire, his cottagers (most of whom he employs as labourers), pay him six pence per week of rent for their house and garden, which is deducted from their wages every Saturday night; and thus the cottager does not feel the inconvenience of paying the whole at once. Those who do not work to pay him a higher rent. Others think it best to exact their rents at harvest time, when the cottagers have most money at command.

might be totally removed, and besides the real necessitous objects of charity, if their funds were properly managed, would be more amply and comfortably provided for, and the poor's rates, at the same time, might be greatly diminished, and that heavy and intolerable burden upon the farmer and the community, would consequently be more easily sustained.

Every cottage should have a small garden annexed to it, sufficient to raise vegetables for the family use. About 25 or 30 perches of ground, properly managed, will answer that purpose. Whatever more land the cottager may have occasion for, he should be dependent on the farmer for it.*

* The following hints, from the Rev. John Townsend of Pewsey in Wilts, on the advantages of cottagers, not only renting land, but enjoying small freeholds, are worthy the reader's attention.

"Having lived more than thirty years in a country village, I have had innumerable occasions to remark a striking difference between the cottagers, who have a garden adjoining to their habitations, and those who have no garden. The former are generally sober, industrious, and healthy, whilst the latter are too often drunken, lazy, vicious, and frequently diseased. The reason for this difference is obvious, because one fills up all his time with useful labour, whilst the other, for want of occupation, takes refuge in the alehouse, where he dissipates his scanty pittance, and destroys his health.

Another striking difference to be noticed, is between those who have freehold tenements, and their neighbours, who are obliged to rent. In the former we commonly observe that openness and honesty, which are seldom to be seen in men who are destitute of property. The peasant, whose ancestors built a cottage on the waste, with a sufficient garden, and the right of commonage for his cow, if he retain this little patrimony, brings up a numerous family without being reduced to the necessity of asking assistance from his parish. This man acquires habits of sobriety and industry, and his property is a pledge to the community for his good behaviour. These good qualities are transmitted to his offspring; and when his children go out to services, they, like their parents, are distinguished for ingenuous conduct; they resemble the sons of freemen, whilst the immediate descendants of those, who have no freehold, too frequently have all the dispositions of a slave.

Commons, it must be acknowledged, if not stinted, starve all cattle; and though stinted, yet cannot be improved, like land that is in severalty. They have this advantage to the poor man, that his property is inalienable, and must descend from the father to his son. Commons, however, should never be admitted in a well regulated state, and when divided, the rights and interests of the cottager should be particularly attended to.

The cottage law of Queen Elizabeth, which required that four acres of land should be attached for ever to each cottage, precluded the necessity of commons. This statute has been repealed. Four acres of land were too much for the spade, and too little for the plough, and therefore it was wise in the legislative authority, at a time when pasture gave place to tillage, to abrogate this law. Yet, perhaps, it would have been more advisable merely to have lessened the quantity of land required for each cottage, than to have dropped this provision altogether.

There are different sorts of cottages, which require different constructions. Cottages of one, two, and three rooms. Some add cottages of four rooms, but these are seldom built, and are more in the style of houses of a superior kind. There are also cottages for the labourer, and for the mechanic of different trades, as carpenters, smiths, weavers, &c. each of whom would require a dwelling of a different construction.*

These different kinds of cottages may be divided into two classes, the plain, and the ornamental, but it is the former only we mean to treat of here. The latter being built chiefly as pleasing objects in different points of view, from the parks or pleasure-grounds of noblemen and gentlemen of fortune. On these, a considerable expence is sometimes bestowed; and when executed and disposed with taste and judgment, they afford the most pleasing variety. Of this kind, the completest I have seen are at Lord Penrhyn's, in Cheshire, whose cottages are disposed with great taste, and adorned with surrounding clumps of planting, each having a pretty little plot of garden ground and shrubbery in front, and some with honey-suckle and jessamine beautifully entwined round the porch and windows. The insides of these are equally delightful with the outside, being kept so excessively neat and clean, that it is a pleasure to view them.

At the Earl of Winchilsea's, in Rutlandshire, are also some very neat cottages,

At the present moment, when it is in contemplation to improve the wastes, and to inclose all commons, would it not be prudent to allot a certain portion of land, perhaps one-eighth of an acre, to each cottage, with a provision, that this little property should be inalienable, and rather go to the most distant relation, than to one who is possessed of land?

Such a provision has been made by Spain in the new settlements of the Sierra Morena, and is found beneficial to the public.

Even in parishes, which have already laid all their common lands in severalty, without making the provision here recommended for the poor, might it not be advisable to give every cottager employed in agriculture, the same quantity of land, on the same conditions as above?

A parish containing three thousand acres of arable and pasture, in proportion to each other, may be cultivated by one hundred families, who according to this proposal would require only twelve acres and a half of land to make them happy. This, at 40*s.* per acre, would cost the parish only 25*l.* per annum, whilst in cabbages, carrots, and potatoes, it would produce the value of more than 300*l.* a year, which produce, would undoubtedly relieve the poor rates to the same amount.

The West India planters have adopted a plan somewhat similar to this, and derive from it the most substantial advantages; for by this they encourage industry, and in the most agreeable manner induce their slaves, by strenuous exertions, to derive profit from every moment of their time."

* See Practical Treat. on Rur. Imp.

kept in excellent order, but his lordship has been at a considerable expence in erecting them.

The plain and simple cottage for the labourer, being the chief object at present under consideration, we shall therefore endeavour to point out the most commodious and best construction for that sort of cottage, and the cheapest manner of executing them.

It is found that an apartment 12 feet square, is sufficiently large for a labourer and his family to eat in, and to hold besides all the furniture and utensils necessary therein. One sleeping apartment over that, partitioned in such a manner as to be most convenient to the family, and least offensive to decency at particular times, will constitute all the lodging required in a simple cottage. Upon these principles the following general rule for the construction of a small cottage may be laid down. Let fig. 1. Plate XXXVI. represent the ground plan. 12 feet wide from A to B, and 16 feet long from B to C, within walls. From the length take 4 feet, CD, which will leave an apartment ABDE 12 feet square, and a space DEFC 4 feet by 12. Divide this space in two equal parts by the line GH. In one of these parts, will be a stair to the upper apartment, and under it a small closet or cellar. The other part will serve for both a pantry and a milkhouse. The upper chamber to be divided as shown in the annexed plans.

The 4 feet space DEFC, taken off the length, may either be on the one end or the other; in a single cottage it matters not which. But as there ought always to be at least two cottages built together, being, besides other advantages, considerably less expensive in proportion than building them singly, that space ought, in my apprehension, to be taken from the extreme ends, by which the vents will be got in the middle wall that separates the two cottages.

In most of the modern cottages I have visited (although many of them, perfect in every other respect), the general complaint seemed to be, that the upper chambers were so excessively hot in summer, and so very cold in winter, they were scarcely habitable. This is owing to the thinness of a slate or tile roof, and to those chambers being so far within the roof. A proper thatched roof is therefore the best preventative of this evil, where there are upper chambers. If the roof is of tile or slate, which is by far the neatest and the most durable, the ceiling should be lathed and plastered, and air-holes with shutters, so contrived that they may easily be opened or shut at pleasure, to give air to the whole roof in hot weather, which will tend greatly to keep the

Plate XXXVI

Curious Stair.

Page 109.

Vide Page 108.

Fig:1

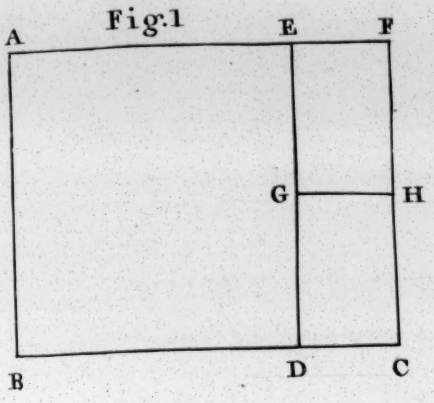


Fig:2

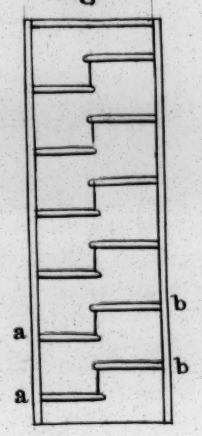
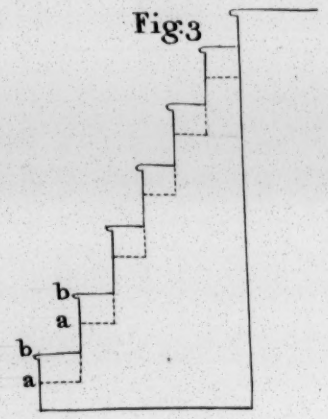


Fig:3



Small Cottages.

Page 112.

Fig:4

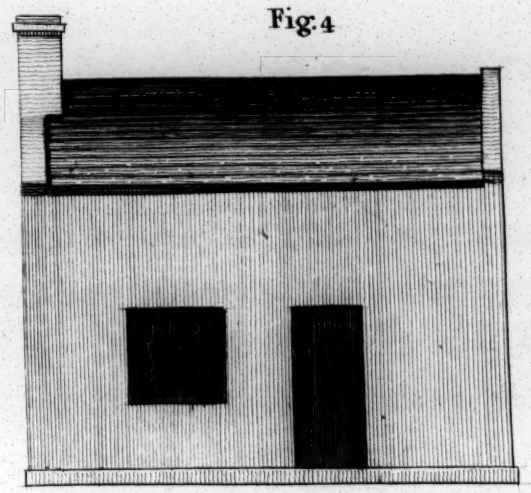


Fig:7

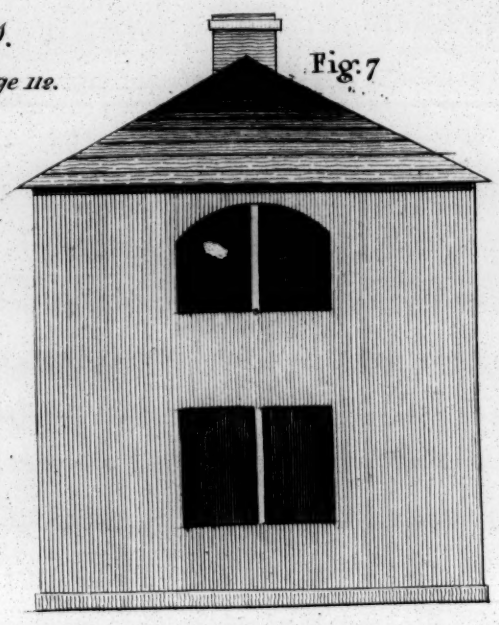


Fig:5

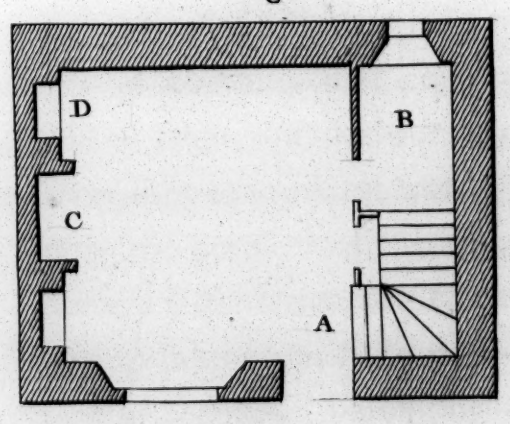


Fig:8

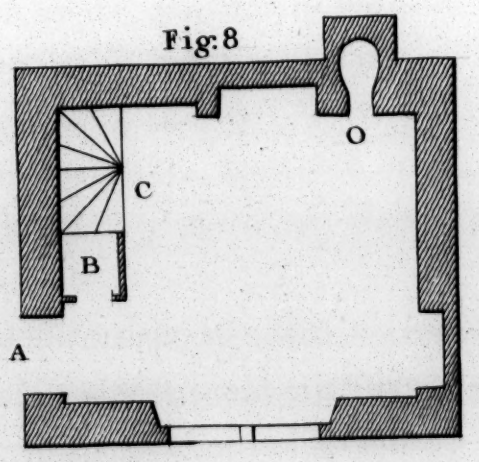


Fig:6

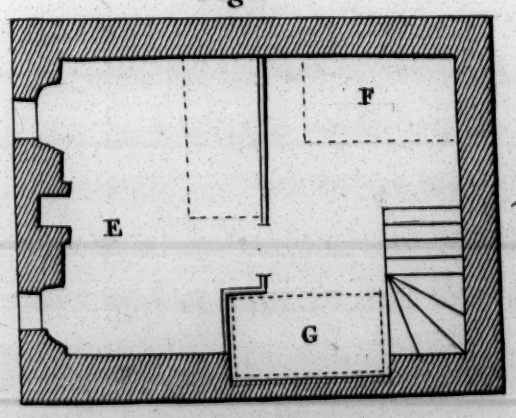
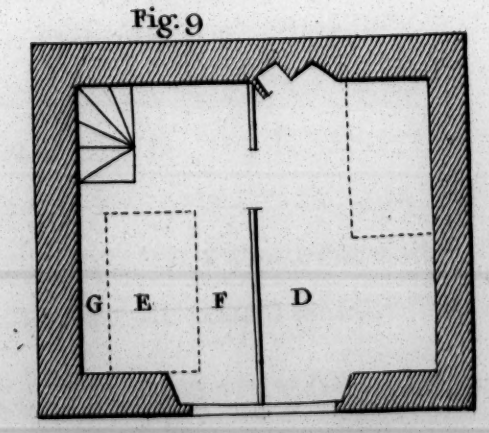


Fig:9



5 0 10 20 30 Feet.

R.Beatson del.t

Neele sculp.t Strand

upper chambers cool in summer. Even a white sheet thrown over that side of the roof most exposed to the sun, or the roof itself whitened, will have also the same effect.

In winter, if the angle in the roof is filled with straw, it will probably prevent the cold penetrating so easily.

To save fuel is certainly a material object to a cottager; and as it would be attended with a considerable additional expence to him, to keep a fire in the sleeping apartment above, as well as below, if a method can be devised, to give the upper apartment some benefit from the fire below, it would surely be of great advantage in cold weather. This might, no doubt, be done by a flue, but some benefit will be derived from the vent being in the middle of the building, particularly if this vent is made as thin as possible where it passes through the upper chamber. If that part of it were made of plate iron, or such as is used in stoves on board of ship, it would add considerably to the warmth of the room. There is still another way that occurs to me that would have a good effect. In all apartments kept warm by a fire, it will be found that the air at the ceiling is considerably warmer than the air below. If, therefore, in a cottage that warm air is permitted to ascend to the apartment above, it is natural to suppose it will render that apartment considerably warmer. This may be accomplished, either by means of sliding hatches, or by gratings in the least frequented part of the floor, made so as to open or shut easily when required. These methods of warming and cooling the upper chambers in cottages, have probably never been tried, and are perhaps new; they may therefore be improved upon. At all events, they are at least worthy of being mentioned, if they can in any degree contribute to the comfort of the cottager.

As every little space is of consequence in a small cottage, in order to make the stair within take up as little room as possible, there is a curious and uncommon contrivance in a cottage belonging to a very respectable gentleman in Cheshire. The stair in this cottage occupies only one half the space in ascending that a common stair does, as will be evident by the following explanation of it. Fig. 2. Plate XXXVI. is a front view of the steps; the width from C to D is 2 feet 5 inches; *a* is the first step, $7\frac{1}{2}$ inches high, upon which the left foot is put; *b* is the step for the right foot, $7\frac{1}{2}$ inches higher, but in the same line with *a*. The left foot is set on *a*, and the right foot on *b*, alternately to the top of the stair. It is therefore clear, that as the steps for the right and for the left foot are in the same line, and although neither foot rises

each time higher than $7\frac{1}{2}$ inches, yet every time that one foot or the other is moved, it rises 15 inches higher than it was before, as will be more evident from the side view, fig. 3. in which the dotted lines show the left foot steps, and the whole lines the steps for the right foot. Suppose, in a stair of this kind, that each tread, or breadth for the foot is 9 inches, and that each rise of the one foot above the other is $7\frac{1}{2}$ inches, as in the figures; consequently as each foot rises the height of two steps, or 15 inches, every time it is moved, it is plain that six steps of this kind will rise as high as twelve in the common way, and will require only one half the size of a hatch or opening in the floor above, that would be required for those twelve steps as usually constructed. This will be of considerable advantage, where much is required to be made of little room, and will of course give more space to the chambers above.

In small cottages, where there happens to be a large family, a great deal of inconvenience often arises (especially when there is a mixture of boys and girls) in accommodating them with decency. This may be in a great measure remedied, by a different mode of disposing the beds from what is commonly followed. The method I would propose, is, to have one bed over another. Where it is thought proper to keep the boys separate from the girls, the entry to the boys' beds may be on one side, and to the beds for the girls on the other side, which will keep them as completely separate as if they were in two different apartments, as will be shown afterwards in the annexed plans.

It has already been mentioned, that two cottages ought always to be built together. To this it may be added, that every cottage should have an upper as well as a lower apartment. This latter opinion is differed from by many, but my principal reasons for recommending it are, because I conceive that upper apartments are more wholesome to sleep in than ground floors; and, as the most expensive part of a cottage is generally the roof, a great deal of roofing will be saved by building one apartment over the other, and some walling besides.

The least expensive way to build cottages will be according to the nature of the materials on the spot. If plenty of stone is at hand, it will not only be the most substantial, but the cheapest material. Brick cottages are the most expensive of any. There is a method of building with earth, which, if properly executed, stands extremely well, and is very cheap. Almost any sort of strong loamy soil answers the purpose. If the soil is light or sandy, a little clay may be mixed with it; but clay itself is not so much esteemed for this kind of work, as it does not ram sufficiently

hard, and is very apt to crack when drying; for the stability of this sort of wall depends greatly on being very hard rammed with a cast iron rammer.*

At Scarsbrick hall, in Lancashire, there is a garden wall built in this manner. Mr. Ecclestone has also built an addition to his house, two stories high, in the same way. They are very well executed, and the surface so even and smooth, that when rough cast, or white-washed, they cannot be distinguished from the finest stone wall. If carefully executed, these would make excellent and cheap walls for cottages.

Another method of building earthen walls, practised, I believe, in some parts of Cornwall, is to take any sort of strong earth fit for making bricks; build the walls with it of the intended height and thickness: let them stand some time to dry; then fill within and round the outside with any sort of brushwood or combustibles, and set fire to them. It is said that when properly burnt, this makes a wall like one solid brick. The doors and windows are cut out afterwards, and the vents built of stone or brick.

The Earl of Winchilsea was recommended by an architect to build a house with *unburnt* bricks. His lordship, ever ready to try any experiment, or to encourage any project that may be useful to society, did so; but the house very soon tumbled down. If his lordship had adopted the Cornish method of filling it, and surrounding it, after the walls were built, with combustibles to set on fire, perhaps the house might have stood equally well as the burnt earthen walls in Cornwall. In this case, however, it would probably be better to lay the bricks in soft well beaten clay than in mortar.

The cheapest sort of roof commonly used is thatch, and the best sort of thatch is a species of strong reed, found in some counties. The Earl of Winchilsea has some sheds and farm buildings covered with reed of this sort, which makes an excellent roof, and has lasted many years.

There is still a cheaper kind of roof, but very little known. That is a brown paper roof, well pitched. This makes an excellent light roof for many purposes, if properly executed.† In the town of Dunfermline, in the county of Fife, is a church with a roof of this kind, which has lasted near fifty years, with very little repair, excepting a new coat of tar every six or seven years. This church is 70 feet long, and 50 feet wide, without any intermediate support for the roof, of which the whole ori-

* For a particular account of this method of building, see Pract. Treat. on Rural Imp.

† Ibid.

ginal expence of papering and tarring amounted only to 14*l*. A very cheap covering, surely, for so large and so wide a building.

The deal flooring is another expensive article in erecting a cottage. In many places a great saving may be made in the expence of this, by adopting the plaster floor, recommended in a paper given to the Board on farm buildings. This kind of floor would answer remarkably well for a cottage; and being more retentive of heat than deals, might tend to keep the upper chamber warmer in winter, by attracting the heat of the fire below.

The following are plans and elevations of the most simple kind of cottage for the labourer, on the principles here laid down. Their roofs are represented as of slate, being by far the neatest. Their external appearance may be varied in different ways, according to the situation where they are built, which ought always to be attended to, for what will have a good effect in one place or point of view may not be so pleasing in another; but this will depend greatly on the taste and fancy of the builder.

EXPLANATION OF PLATES XXXVI. XXXVII. XXXVIII.

Plate XXXVI. fig. 1, 2, and 3, already explained.

Fig. 4. Elevation of a small cottage.

Fig. 5. Ground plan of the same cottage. A the stair with a small closet under it; B the pantry, or milkhouse; C the fire place, which may have an oven at the side D if required.

Fig. 6. Plan of the chamber floor. E the apartment for the man and wife; F a bed for girls; G bed for boys.

Fig. 7. Elevation of another small cottage.

Fig. 8. Ground plan of the same cottage. A the door; B pantry; C the stairs; O an oven, requiring a small projection without the wall, which must be properly covered to keep out wet.

Fig. 9. Chamber floor of the same cottage. D apartment for the cottager and his wife; E two beds, one above the other. The entry to the bed below for the girls being at F, and the entry to the bed above for the boys being on the side G. By making beds in this form, even with the entry to both on the same side, a large family may be accommodated in very little room.

Plate XXXVII. fig. 1. Elevation of two cottages together, with the vents in the partition wall betwixt them.

Fig. 2. Ground plan of these two cottages. AA stairs to the upper chamber; BB pantries, or milkhouses; CC ovens.

Fig. 3. Chamber floor, showing different ways of placing the beds. D apartment for the

Double Cottage.

Vide Page 112.

Fig. 1.

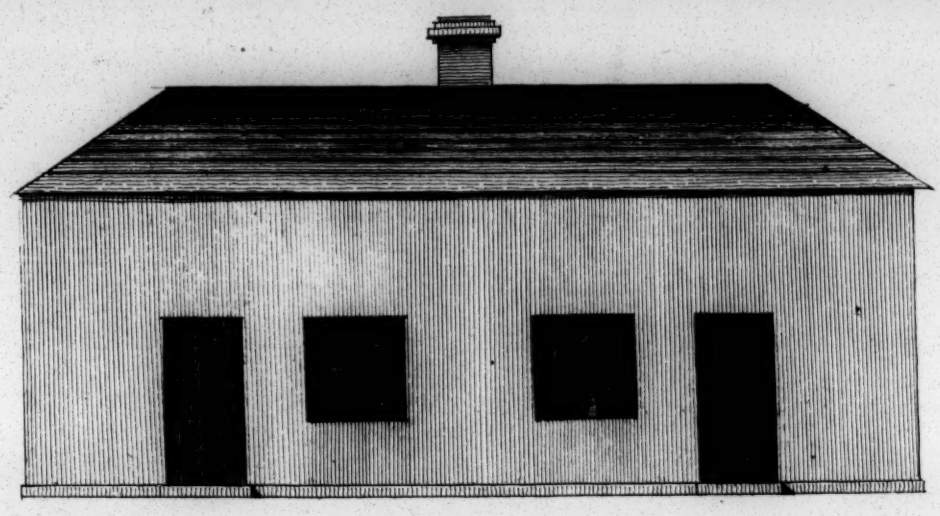


Fig. 2.

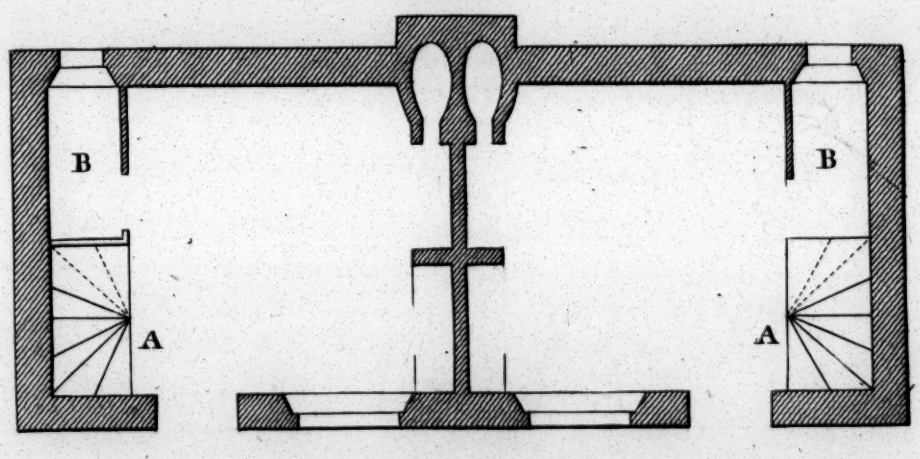
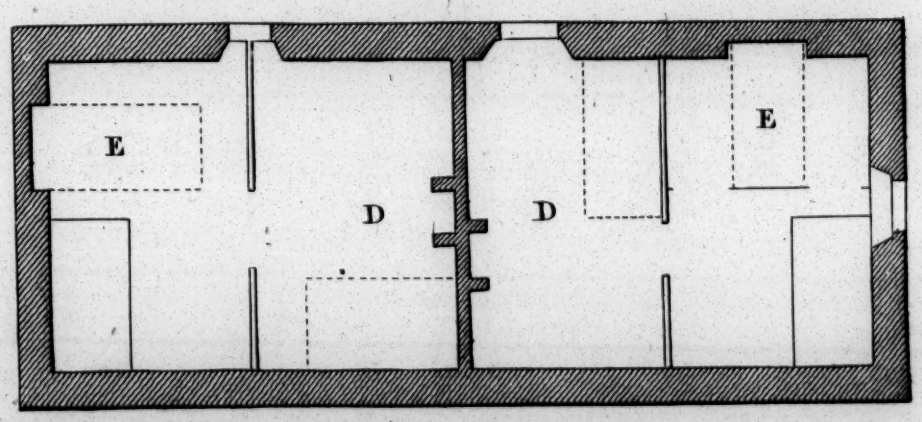
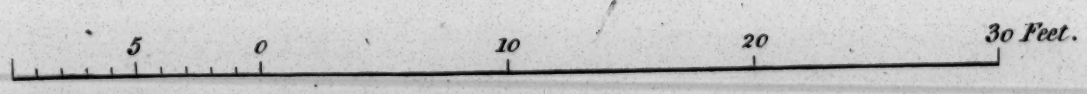


Fig. 3





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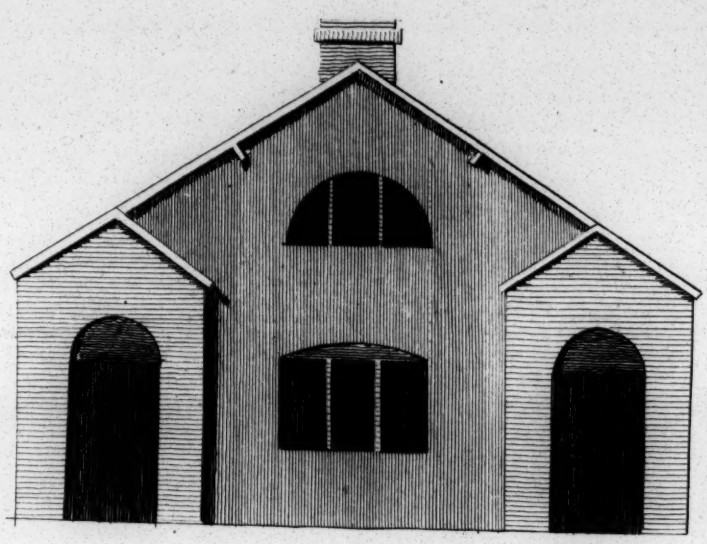
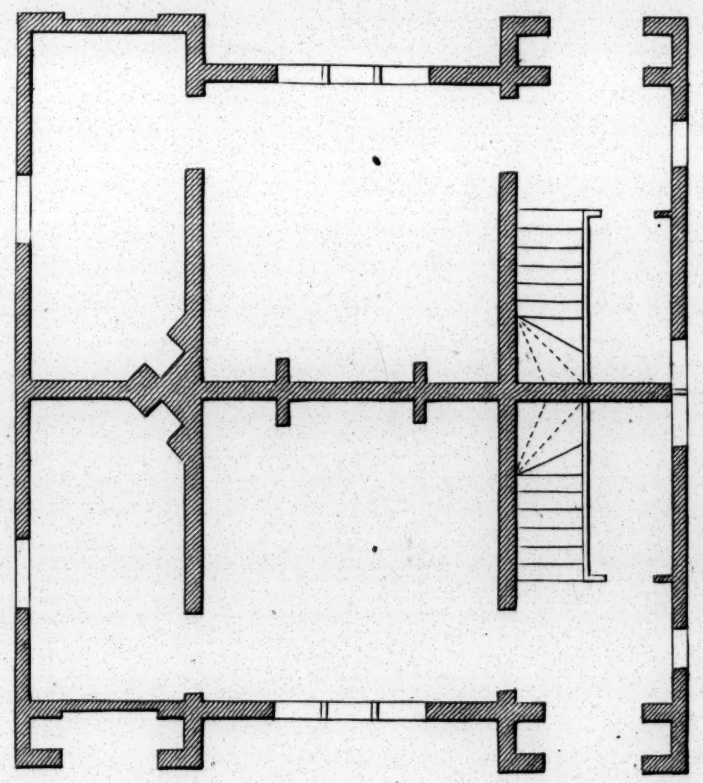
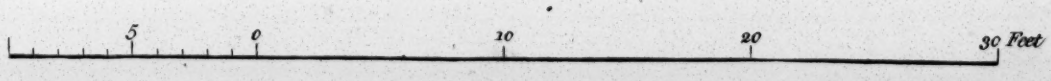
Double Cottages of Lord Penrhyn's at Winnington.

Vide Page 113.







R.Beatson delᵗ.

Neele sculpᵗ Strand.

man and wife; E beds containing one above another, with the entries on different sides as explained in the last plate.

Plate XXXVIII. Elevation and ground plan of a double cottage at Lord Penrhyn's, in Cheshire. This cottage has an exceeding pretty effect from the road, as indeed all his lordship's other cottages have. They are designed by the ingenious Mr. Wyatt, architect, who also designed his lordship's elegant and beautiful poultry place, in all which he has displayed so much taste and judgment.

It is unnecessary here to give a description or drawings of his lordship's other cottages,* or to enter more at large on the subject of cottages in general.

The remarks here made are intended solely for those plain and simple cottages, which may be of the most general utility in accommodating the labourer comfortably, and benefiting the industrious farmer. The plans now submitted may be executed at a small expence, and will afford the most comfortable habitation to the labourer. It is hoped they would also, if built on every suitable place upon a farm, produce those numerous advantages to be derived from a more general erection of cottages. If in any respect they contribute to so desirable an end, the anxious wishes of the author, to promote the comfort of so valuable a description of persons, will be answered.

* Pract. Treatise on Rur. Imp.

XI. *On Cottages. By* A. Crocker *and Son, Land Surveyors, Frome.*

A BILL for inclosing the waste lands of the kingdom having been introduced into the House of Commons, under the auspices of the Board of Agriculture, and as so beneficial a bill cannot fail, sooner or later, to pass into a law, and as in consequence thereof, many small houses must necessarily be built, suited to small estates issuing out of allotments of such wastes, we have been induced to submit to the consideration of the Board three plans of such small houses; to be built of different species of materials.

The first is with mud walls, composed of soft mire and straw, well trodden together, and which, by degrees is laid on, *stratum-super-stratum*, to the height required; a species of building not uncommon for cottages, and even for better houses, barns, &c. in the western and some other parts of the kingdom. It is the cheapest habitation that we can construct, and is also very dry and comfortable.

The second has generally a footing of stone wall, two feet high, on which is placed a strong sill of timber; to which is superadded uprights of quartering, two feet apart, into which are inserted rounds of rough wood, like ladder-work, at six or seven inches one above the other, to the height required: the spaces between the rounds are well filled with a mixture of mire and long straw, previously well trodden together, provincially called *cab-dab*; the whole is then plastered with good mortar, and rough casted. These kinds of buildings are used where stones are scarce, or where cheapness is the leading object.

The third is built with rough stone masonry, and sometimes stuccoed over; and although it is more expensive than the others, yet it is the strongest and most desirable of any, where materials are to be had without great expence of carriage.

Plate XXXIX. fig. 1. is for a small cottage, built with mud walls; which, with a floor of earth, well rammed, may be erected (of the dimensions given), for the small expence of 27*l*. The chambers of which may be lighted at the ends.

Fig. 2. Is for a cottage on a larger scale, which may be built of cab-dab, at the expence of 58*l*.

Plate XXXIX.

by M.r Crocker. Vide p.114.

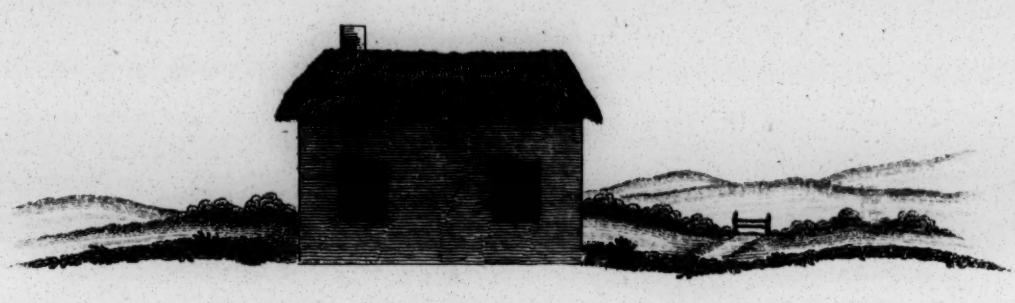
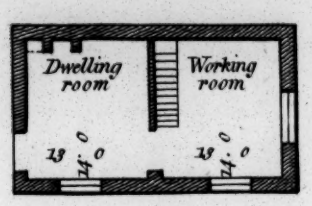


Fig.1



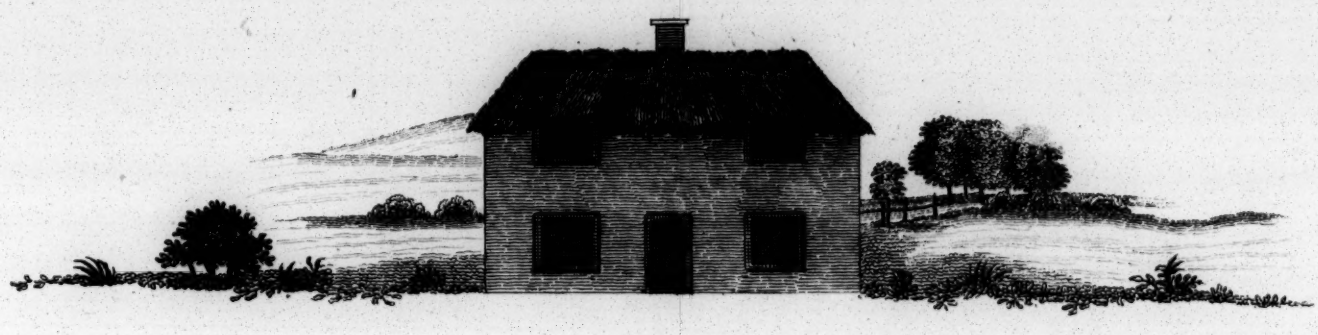
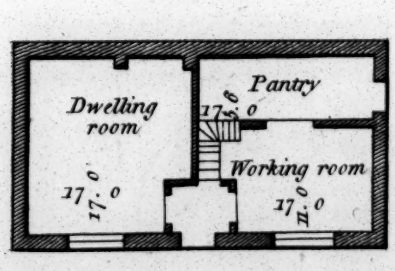


Fig. 2



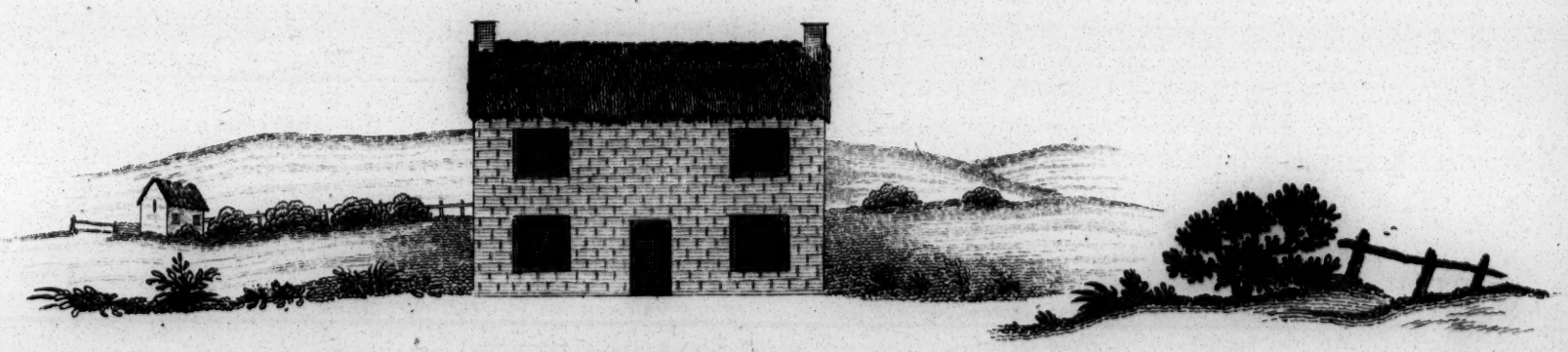
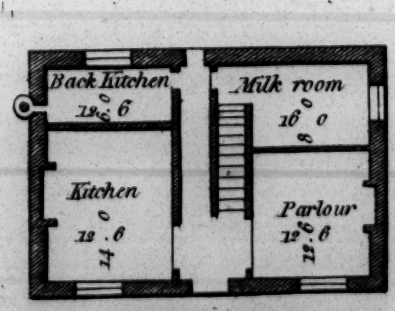
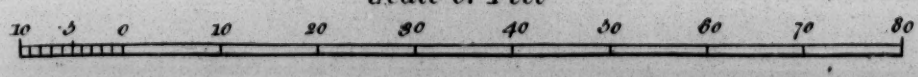


Fig.3



Scale of Feet



A.Crocker del.

Neele sculp.t 352 Strand.

G R III.
BRITISH MUSEUM

Fig. 3. Is for a dwelling house, suited to various purposes, which may be built of rough masonry, at the expence of 96*l.**

Frome, 12*th* May, 1796.

* The late Mr. J. Wood of Bath, architect, in a work intitled " a Series of Plans for Cottages, &c." Printed by Taylor, 56, Holborn, has thrown much light on the construction of habitations for labourers, and has laid down the following seven principles, as the means of obviating any inconveniences to which cottages, as usually built, are liable.

1st. The cottage, he observes, should be *dry and healthy*; this is effected by keeping the floor sixteen or eighteen inches † above the natural ground; by building it clear of banks, on an open spot of ground, that has a declivity or fall from the building, by having the rooms not less than eight feet high; an height that will keep them airy and healthy; and by avoiding having chambers in the roof.

2dly. *Warm, cheerful, and comfortable.* In order to attain these points the walls should be of a sufficient thickness (if of stone, not less than sixteen inches; if of brick, at least a brick and a half) to keep out the cold of the winter, or the excessive heat of the summer. The entrance should be skreened ‡ that the room, on opening the door, might not be exposed to the open air, the rooms should receive their light from the east or the § south, or from any point betwixt the east and the south; for if they receive their light from the north, they will be cold and cheerless; if from the west, they will be so heated by the summer's afternoon sun, as to become comfortless to the poor labourer after an hard day's work; whereas, on the contrary, receiving the light from the east or the south, they will be always warm and cheerful; so like the feelings of men in a higher sphere, are those of the poor cottager, that if his habitation be warm, cheerful, and comfortable, he will return to it with gladness, and abide in it with pleasure.

3dly. *Convenient*; by having a porch or shed, to skreen the entrance, and to hold the labourer's tools; by having a shed to serve as a pantry, and store place for fuel; by having a privy ‖ for

† For want of this precaution, I have always observed, that in wet summers and throughout the whole winter, the walls sucked up (if I may be allowed the expression) the water, and are damp for at least a yard high; and this happens not only where the walls are thin, but even in buildings where they are thick.

‡ This circumstance must be particularly attended to, in those rooms where there is intended to be a bed.

§ At first view this nicety may appear trifling, but on mature deliberation will prove of very material consequence.

‖ This convenience will answer many good ends, but in nothing more than being an *introduction to cleanliness.* In the account of the Voyage to the South Sea, published by Dr. Hawkesworth, speaking of the inhabitants of New Zealand, is the following passage; " In personal delicacy, they were not equal to our friends at Otaheite, for the coldness of the climate did not so often invite them to bathe, but we saw in them one instance of cleanliness, in which they excelled them, and of which perhaps there is no instance in any other Indian nation, every house, or every cluster of three or four houses, was furnished with a privy, so that the ground was every where clean." What a reflection is this on the greatest part of the inhabitants of Britain, to be exceeded in neatness in any

cleanliness and decency's sake; by a proper disposition of the windows, doors, and chimneys; by having the stairs, where there is an upper floor, not less than *three feet* wide; the rise or height not more than *eight inches*, and the tread or breadth not less than *nine inches*; and lastly, by proportioning the size of the cottage, to the family that is to inhabit it; there should be one lodging room for the parents, another for the female, and a third for the male children: it is melancholy to see a man and his wife, and sometimes half a dozen children, crowded together in the same room, nay often in the same bed; the horror is still heightened, and the inconveniency increased, at the time the woman is in child-bed, or in case of illness, or of death; indeed whilst the children are young, under nine years of age, there is not that offence to decency, if they sleep in the same room with their parents, or if the boys and girls sleep together, but after that age they should be kept * apart.

4thly. Cottages should not be more than *twelve* feet wide in the clear, † being the greatest width that it would be prudent to venture the rafters of the roof with the collar pieces ‡ *only*, without danger of spreading the walls; and by using collar pieces, there can be fifteen inches in height of the roof thrown into the upper chambers, which will render dormer windows § useless.

5thly. Cottages should be always built in *pairs*, either at a little distance from one another, or close adjoining, so as to appear one building, that the inhabitants may be of assistance to each other, in case of sickness or any other accident.

6thly. As a piece of economy, cottages should be built strong, and with the best of materials, and these materials well put together; the mortar must be well tempered and mixed, and lime not spared; hollow walls bring on decay, and harbour vermin; and bad, sappy timber soon reduces the cottage to a ruinous state; although I would by no means have the cottages fine, yet I recommend regularity, which is beauty; regularity will render them ornaments to the country, instead of their being at present disagreeable objects.

one point, by that barbarous race of people the New Zealanders? I could mention many large and opulent towns, particularly on the sea coasts, nay some large cities, where there is scarcely such a convenience in the whole place, for want of which the streets are perfect jakes; to the annoyance of both inhabitants and strangers.

* I am aware that the statute of the 5 Eliz. concerning the apprenticing poor children, and compelling adults to go out to service, will be here objected to me; but the objection soon vanishes when we consider, first, that it may be policy, in many cases, to let the children live at home with their parents till they are grown up, particularly in the manufacturing countries; where the trade of the father will be more carefully taught the children, whose earnings often, nay generally, contribute to the better maintenance of the family. Secondly, the power given to the parish officers by that act, is very much circumscribed, and is confined merely to their own parishes; indeed they may, if they can find proper masters in other parishes, bind out their orphan poor, and the children of such poor as are willing to part with them; but this must be done by consent of the magistrates, who should be very careful how they take the burthen off from one parish, and lay it on another.

† Twelve feet is a width sufficient for a dwelling, that is to be deemed a cottage; if it be wider, it approaches too near, to what I would call a house for a superior tradesman; besides, it would require longer and stronger timbers, girders to the floors and roof, and consequently greatly enhance the expence; a circumstance one would wish in all buildings to avoid.

‡ A collar piece, is that piece of wood which ties the rafters together at some height above the wall plate, and is generally tailed into the rafters.

§ Because the room being six feet and ten inches high to the top of the wall plate, there will be sufficient height to make a window in the side wall, under the plate.

7thly. A piece of ground should be allotted to every cottage, * proportionable to its size; the cottage should be built in the vicinity of a spring of water, a circumstance to be much attended to; and if there be no spring, let there be a well.

On the foregoing seven principles, I recommend all cottages to be built; † they may be divided into four classes or degrees: first, cottages with one room; secondly, cottages with two rooms; thirdly, cottages with three rooms; and fourthly, cottages with four rooms. Mr. Wood has given plans of each of those kinds of cottages, which have great merit in the form of their construction.

* This will hold good in the country, where ground is not of so great a value, but in towns we must be content with a small outlet behind.

† I cannot more properly than in this place observe, that near Dorchester, in Dorsetshire, there has been lately erected a row of cottages for the accommodation of adjoining farms, in which there has not been the least attention paid, either to the principles of sound building, or to decency or conveniency. The entrances are from the west, and not skreened; the windows are to the same point, the cottage is 17½ feet wide in the clear, and the whole triangular space of the roof occupied as a chamber. The consequence is, that the walls, which have not been built more than three years, are already considerably spread, and must in a short time fall down; the poor inhabitants told me that they could scarcely support the heat of these rooms in the summer, and that they were quite frozen in the winter. The indecency of one chamber for a large family is here very striking; and what adds to the shamelessness of it, was the partitions between house and house being nothing more than thin rough boards, not jointed; and yet the rent paid for each cottage is 52*s.* a year. It is a pity that gentlemen, who build cottages for the accommodation of their labourers, did not study stability for their own sakes, and conveniency and decency for the sake of the inhabitants; for, believe me, the poor man wishes for conveniency, but knows not how to remedy himself, and would be decent, was it in his power.

ERRATA.

Page 15, line 3, for *letticed*, read *latticed*.
—— 19, — 21, for *the deal*, read *thin deal*.
—— 24, — 9, for *follows*, read *follow*.
—— 25, — 18, insert *Plate XIV*, before *fig.* 6.
—— 44, — 9, for *it is confined*, read *this practice is confined*.
—— 45, — 5, for *the shovel*, read *a shovel*.
—— 50, — 5, for *farm of any, and*, read *farm of any size, and*, &c.
—— 53, — 7, for *berst framing*, read *birst framing*.
—— 54, — 1, for *of the houses*, read *of houses*.
—— 54, — 7 and 8, for *three hoppers; e e e*, read *three hoppers e e e*.
—— 54, — 16, for *hopper*, read *hoppers*.

COMMUNICATIONS

TO THE

BOARD OF AGRICULTURE.

ON

ROADS.

PART III.

GR III
BRITISH MUSEUM

COMMUNICATIONS

TO THE

BOARD OF AGRICULTURE;

ON SUBJECTS RELATIVE TO

THE HUSBANDRY,

AND

INTERNAL IMPROVEMENT

OF THE COUNTRY.

VOL. I.

Omnium rerum, ex quibus aliquid acquiritur, nihil est agricultura melius, nihil uberius, nihil dulcius, nihil homine libero dignius. CIC. DE OFFIC. I. C. 42.

PARTS III. AND IV.

LONDON:

PRINTED BY W. BULMER AND CO.

FOR GEORGE NICOL, BOOKSELLER TO HIS MAJESTY,
AND TO THE BOARD OF AGRICULTURE;
AND SOLD BY MESSRS. ROBINSON, PATERNOSTER-ROW; J. SEWELL, CORNHILL;
CADELL AND DAVIES, STRAND; W. CREECH, EDINBURGH; AND J. ARCHER, DUBLIN.

1797.

ROADS.

XII. *Observations on Making and Repairing Roads, wherein are suggested several Improvements on their Construction, and on Wheel Carriages.* *By* Robert Beatson, *of Kilrie, Esq. late of his Majesty's Corps of Royal Engineers.*

SECTION I.

General Observations.

THE advantages and conveniences arising from a free and easy communication through all parts of a country, are so numerous, and so universally felt by all ranks of society, that no pains or expence should be spared to attain them; for without an easy intercourse, every sort of internal commerce or improvement, must either be exceedingly clogged, or altogether at a stand.

Roads and canals, or navigable rivers, may justly be considered as the veins and arteries through which all improvements flow. To internal commerce and agriculture, they are as the veins and arteries to the human body. Through these the blood circulates in every direction, and thus keeps alive the animal system; but, if this circulation is by any means checked or obstructed, even in the remotest part, that part soon becomes useless, and sinks into decay, and in some degree is felt throughout the whole body. So it is with respect to the commercial and agricultural systems. Without a free and uninterrupted intercourse, it is impossible they can exist, or at least produce, to the community at large, so many important benefits as they otherwise might have done. How many, for example, are the places in almost every country, that might be rendered doubly valuable, was the access practicable and easy. How immense the quantities of the finest timber, perhaps, growing in inaccessible woods, which on that account alone are lost to society. How many the valuable *strata* of the richest metals and minerals, which, from the same cause, lie buried and undisturbed in the bowels of the earth; and how many thousands of acres of the most fertile soil, that might be improved and cultivated to the highest degree of perfection,

and thus very largely contribute to increase the food and the comforts of man, were the ingress and egress rendered practicable and free.

The value of a farm, consequently the riches, perhaps the strength of a country, greatly depend on an easy and uninterrupted communication. The Romans were so sensible of this, that we are told they did not think it beneath the dignity of the commonwealth, to attend to the conveniences arising from good roads. That great and wise people, it is said, carried on, at an immense expence, roads whose remains are to this day the admiration of the curious, from the centre of the empire to many of the remoter provinces. The readier march of their armies was, perhaps, their first motive, but the easier intercourse of the several parts of that great empire was another, which they had too much prudence and too much wisdom to overlook. We are also told by Diodorus, Strabo, and other historians, that the famous Semiramis being so fully convinced of the importance of an easy and general intercourse, applied herself to render the roads practicable throughout the whole extent of her empire.

Doctor Adam Smith, in his Wealth of Nations, says that " in China, and several " other governments of Asia, the executive power charges itself both with the repa- " ration of the high roads, and with the maintenance of the navigable canals. In the " instructions which are given to the governor of each province, those objects, it is " said, are constantly recommended to him, and the judgment which the court forms " of his conduct, is very much regulated by the attention which he appears to have " paid to this part of his instructions. This branch of public police, accordingly, is " said to be very much attended to in all those countries, but particularly in China; " where the high roads, and still more the navigable canals, it is pretended, exceed " very much every thing of the same kind which is known in Europe." The same author says, that " in France the funds destined for the reparation of the high roads, " are under the immediate direction of the executive power. Those funds consist, " partly in a certain number of days' labour, which the country people are, in most " parts of Europe, obliged to give to the reparation of the highways; and partly in " such a portion of the general revenue of the state, as the king chooses to spare from " his other expences."

Turnpike Laws.—In Great Britain, the turnpike laws are liable to many exceptions; for although immense sums of money are annually levied for the purpose of making and repairing the highways, yet either from bad management, from party influence, or from the chicanery and ignorance of surveyors and contractors, the roads in many

places, are not only laid out in the most absurd direction, but are so badly constructed, and kept in so wretched a state of repair, that they are almost impassable. It is surprising, that in so enlightened a country, and where the turnpike laws have so much engaged the attention of many very ingenious men, those laws should still remain so very defective; more especially as there is hardly a country gentleman who attends a turnpike meeting, but considers himself completely master of the whole business and management, as well as of the making of roads; at least, if we may judge from the violent disputations and bickerings that frequently happen at these meetings, where a proposed new line of road, or perhaps the repair of an old one, will sometimes be contested with as great keenness and vehemence, as if the parties were contending whether Great Britain shall be a monarchy or a republic.

It too often happens, that party influence rules the proceedings at such meetings, and that those who are entrusted with the management of this business, delegate their powers, and trust the inspection and whole management and direction of the roads, to some ignorant or pretended surveyor; who, almost to a certainty, will impose upon them, especially if he is empowered to settle with contractors; and thus the business of the public, in one of its most important concerns, is either altogether neglected, or terminated according to the convenience of the strongest party, without any regard to the interests of the community at large. In support of this assertion, I have only to refer to many parts of the principal thoroughfares in Britain. In some, it will be observed, the roads are directed in the most irregular zig-zag manner, through a level part of the country, where they ought evidently to have gone straight forward. In other places, the traveller and the public, and the poor overloaded horse, are obliged to submit to all the inconvenience, the labour, and the fatigue of ascending and descending the steepest hills, when they might have gone, with the greatest ease and comfort, on a level road.

I am far from thinking it would either be just or proper, to force a road, unnecessarily, through any part of a gentleman's property, without his consent, unless for very powerful reasons indeed. If to avoid a steep ascent, or to shorten the distance considerably, and that there is no other way to do so, in that case there should be no hesitation; but if the advantages to the public are not very material, and that another line can be adopted, nearly as good, which will do less injury to an individual, the latter line should unquestionably be preferred.

It is one of the greatest blessings of the British constitution, the protection afforded

to private property. If ever that is once suffered to be wantonly violated, it is then full time for Britons to complain; but while private property is held sacred, while even a turnpike road cannot be carried through it without the proprietor's consent, or an act of parliament, and while every man is allowed to enjoy unmolested whatever he is possessed of, and to dispose of it in any manner he thinks fit, he has great reason to be thankful for so valuable a blessing, and should be very jealous indeed of allowing any encroachment, or alteration, to be made on so truly estimable and so perfect a work.

Nevertheless, it should be a general maxim, that private considerations ought, in all cases, to give way to public convenience and advantage. Society is formed for the mutual and general benefit of the whole, and it would be a very unjust measure to incommode the whole, merely for the convenience, or perhaps to gratify the whim or caprice of an individual. However, the property of an individual ought by no means to be taken to serve the public, without allowing him, not only the full value, but more than the value, proportioned to the inconvenience or injury he may sustain.

While the present turnpike laws remain in force, and the common mode is practised of choosing surveyors annually, or by rotation, without the smallest regard to abilities or experience, it cannot be expected the public convenience will be so much attended to as it ought to be; neither is it to be expected, that the generality of surveyors, so chosen, can know the proper directions to give, in making or repairing roads, nor the proper manner of making estimates, so as either to conclude an agreement with an artful contractor, or to form a correct judgment of such proposals as may be made.

From these disadvantages, it is inconceivable the loss that may be occasioned, or the mischief that may be done, by an ignorant and inexperienced surveyor.

Character of a Road Surveyor.—A surveyor of roads, should be a man of considerable abilities, and of the strictest honour and integrity. A man not apt to be swayed by party influence, or by private or personal considerations; for if he once allows himself to be led away or biassed by these, or to act in any manner inconsistent with the public interest, he is unfit for that office. He ought not to be a man, who has all his lifetime been confined to the narrow limits of a single district or county, or who has suddenly, or by a slender recommendation, been brought forward, as a person fully qualified for so arduous an undertaking. He ought to have seen, in various places,

the different systems adopted in the management and construction of roads, and to have made it a particular object of his attention, the judging of the best and most advantageous practices.

Another probable reason why that, under the present system, the public roads cannot be so impartially managed and conducted as they ought to be, is the unlimited power given to country gentlemen, over the roads in the county or district in which they live. Many of those gentlemen, for their benevolence and liberality, are truly deserving of every praise that can be bestowed upon them; but, however honourable and respectable they may be, and however desirous to promote the public good, it would be doing an injustice to human nature to suppose, they can view, with impartial eyes, the fine plantations, the beautiful inclosures, and other improvements, they have made on their estates. We may as well imagine, that a doting mother, can coolly and deliberately see an incision made in the skin of a darling child, however much it may be benefited by the operation, as that a country gentleman, can with indifference behold a turnpike road, carried through an inclosure, which he himself has been at the pains and the expence of adorning.

So situated, it is natural to believe this gentleman would wish that road to go in any other direction, even though it should not be quite so convenient to the public. He will not only use his own persuasion and endeavours to point out arguments against its coming that way, but he will even endeavour to prevail on his friends to exert themselves also, and thus a party is often formed in opposition to the public interest; and if he is a man of opulence and power, and generally respected, it is more than probable his influence will prevail.

To remedy these evils, it appears to me, there should be a controlling power over the measures proposed by country gentlemen respecting turnpike roads: for to allow those gentlemen to decide ultimately on the laying out a new road through their own lands, or even on the distribution of the money to be expended in repairing old roads, is, in fact, making them judges in their own cause. In short, it is an object so truly important to the interests of the community at large, and of the kingdom in general, to procure the most easy, safe, and expeditious, and the least expensive intercourse with every part, either by means of the best roads, or the easiest constructed navigable canals, that it is a measure, I presume, highly deserving the attention of the legislature; and it is a field so wide and extensive, and in which there is such an immensity of business to attend to, if properly managed, that it would almost require a Board

for that particular purpose,—a Board of Roads and Internal Communications.—In this Board might be vested the controlling power and management of all the public roads and canals in the kingdom; the letting of the tolls, or collecting the revenues arising from those roads and canals;* the issuing orders for making and repairing them, and money for that purpose; and, in short, the whole power of regulating and deciding every thing respecting so important a trust. Under this Board should be appointed, the most able surveyors and inspectors, to each of which should be allotted a certain county or number of counties; and they might be changed annually, or triennially, from one district to another, that they may the more generally know the best practices followed in different places, and be the less liable to form intimacies or partialities. Over these district surveyors, should be a general surveyor, resident mostly with the Board, but occasionally to visit different parts as circumstances may require.

If a plan of this nature, or something similar to it, were adopted, we should then no more hear of those numerous complaints that are so often made respecting the abuses committed in the management of turnpike roads, and of the money levied at the toll bars; at many of which, it is said, "the money levied is more than double "of what is necessary for executing, in the completest manner, the work which is "often executed in a very slovenly manner, and sometimes not executed at all."†

Should such a Board as above mentioned be thought unnecessary, there is no other institution so justly entitled to such powers being vested in them as the Board of Agriculture and Internal Improvements: for as good roads and canals are the *primum mobile* of all internal improvements, there is no object more highly deserving their attention; but on the broad scale necessary to make such powers effectual, and on account of the prodigious variety of circumstances and situations necessary to be attended to, together with the other numerous and very important avocations which require the attention of the Board of Agriculture, it is hardly to be supposed they could undertake so large an increase of additional labour.

Navigable Canals.—Having mentioned navigable canals, I must beg to observe, that I do not mean those canals already executed, which, being private property, ought not to be meddled with; for I do believe that, in general, they could not be put under better

* These revenues must be very considerable, and would be worth ascertaining.

† Wealth of Nations, Vol. 3. p. 98.

management for the public good than as at present conducted, the advantages arising from them being most essentially felt in every part of the country through which they open a communication; at the same time, it would be a great advantage to the public, if the rates of carriage on these canals were considerably lowered, on every article used in building, or for agricultural purposes.

The canals I allude to are those, which, in my humble opinion, ought to be made either at the public expence, or by subscription, in every part of the kingdom susceptible of so great an improvement, and through which it is an object to open a communication.

The enormous sums of money that have hitherto been expended in making canals, and the numberless difficulties that have come in the way, by constructing such stupendous and extravagant works, impress most people's minds with an idea of the impracticability of making canals, in many places, where they might be made with the greatest ease imaginable, and, comparatively speaking, at a trifling expence. I will venture to assert that, in many situations, navigable canals of considerable extent, and fit for every purpose of agriculture and internal communication, may be made, if properly and economically constructed, at a cheaper rate than even some turnpike roads of the same extent; but as the practical part of this subject is fully explained in another work, I shall refer to that for further information concerning it.*

If government were to advance an adequate sum of money to make such canals, wherever they may be judged beneficial and of importance, it is inconceivable the advantages that would of consequence follow. At the same time the money so expended, if judiciously laid out, and under proper management, might afford a very considerable revenue, besides being the means of bringing into a state of cultivation many large tracts of country, which now lie barren and waste. A few hundred thousands of pounds, judiciously laid out in this manner, would produce to the nation at large, infinitely more numerous and more permanent advantages, than as many millions laid out in foreign countries, whether in times of war or times of peace.

Waste Lands.—The great importance and advantage of improving the waste lands in the kingdom, and of bringing into a more perfect state of cultivation those common fields and other lands, which at present do not yield any thing equal to what

* Practical Treatise on Rural Improvements.

they might produce, are subjects which have so much engaged the speculative attention of many ingenious writers, and which are so clearly demonstrated in Sir John Sinclair's very able Address to the Board of Agriculture, on the 29th of July, 1794, that it is unnecessary here to dwell upon them. Sir John states that, in England and Wales, the number of acres to be improved may amount to about 22,351,000, and the additional annual produce, estimating at only £1. 7*s.* per acre, would amount to £30,173,850!!

Chat Moss and Trafford Moss.—That there are many parts of the kingdom which, in their present state, are worth nothing, and at the same time are capable of being raised to a much higher value than even in the above estimate, I have every reason to believe; and I shall mention only one instance of an extensive moss in Lancashire, called Chat Moss, which, together with Trafford Moss near it, contains about 6000 acres. These mosses are now improving in a very masterly manner, by the ingenious and enterprising Mr. Wakefield, near Liverpool; who, by having the advantage of a part of the Duke of Bridgewater's canal passing through them, will in a short time make them a most beautiful and valuable estate, from being a barren bleak moss, producing nothing but heath and peat. It is said, that he will almost to a certainty, raise the greatest part of these gloomy tracts to the value of about £3. per acre.

This is one very striking instance, of the immense advantages to be derived from an easy communication, or inland navigation; for without this advantage, the above mentioned mosses could not have been brought to so high a value, but perhaps might for ever have remained a bleak and barren waste.

In travelling through most parts of the kingdom, it is really melancholy to see the immense tracts of fine land that lie in a state of nature, although capable of the highest improvement. And when we are told, though it cannot be exactly ascertained, that these uncultivated tracts in Great Britain, amount to more than twenty-two millions of acres; in Scotland to above fourteen millions two hundred thousand, and in England to above seven millions of acres; an extent of country more than five times greater than all the United Provinces put together: yet calculating it only at twenty millions, when we think of the immense sums of money that have been expended, and the oceans of blood that have been spilt, in acquiring and maintaining distant territories, while so great an extent of country still lies waste in the very bosom of the empire, our amazement is increased to a degree beyond description.

When we contrast with this the richness and fertility of the United Provinces; the prodigious disadvantages, and the numerous obstacles the Dutch had to contend with, before they could even secure themselves from the ravages of the ocean; when we consider that in Great Britain no such disadvantages or obstacles were ever in the way of improving those extensive wastes, and that the soil is in general much more fertile than the Dutch had originally to work upon: finally, when all these things are considered, I blush to draw a comparison which must in this case be so truly disgraceful and humiliating to Britons. Let us therefore draw a veil over the conclusion that would follow, and suppose that in Great Britain the genius for improvement has never yet been fully roused, or that the people have been so misled and blinded with the ideas of foreign conquests and extensive colonies, that they have never yet seriously turned their thoughts towards improving the mother country, or to colonizing at home.

It is to be hoped, however, that genius is now aroused, and that under the auspices of the Honourable Board of Agriculture, its influence will soon be extended over the whole kingdom. It is moreover to be hoped, that by their truly patriotic exertions, the time is now at hand when every possible attention and encouragement will be given towards the improvement of those extensive tracts, which, in their present state, are a reproach on the character of so opulent and so powerful a nation.

If the revenues of the state were in some degree dependent on the produce and the rent of the land, and were government more deeply interested in the success of any great and extensive undertaking that might be engaged in, it would perhaps be a very fortunate circumstance for the speedy and general improvement of the country; for to carry on such improvements so as to become a national benefit, is hardly in the power of only private individuals.

Where this is the case, as in China, and several other parts of Asia, it is the interest of the government to give every assistance in its power to promote agricultural improvements, and to render the produce of the country as great as possible; " but," says Doctor Smith, " in order to render that produce both as great and as valuable " as possible, it is necessary to procure to it as extensive a market as possible, and " consequently to establish the freest, the easiest, and the least expensive communi- " cation, between all the different parts of the country, which can be done only by " means of the best roads, and the best navigable canals."

If ever the land-tax in Great Britain were equalized, as has often been talked of,

and the revenues of the crown to rise or fall according to the produce of the land, how immense would be the acquisition of revenue by the improvement of the waste lands. Even while the land-tax continues being levied as at present, if government were to assist in improving those wastes, and in making canals and roads, and to have a certain proportion of the increased annual produce, the addition to the revenue would be very considerable. According to the statements already mentioned, if government were to get only one-tenth of the increased produce, it would bring an addition to the revenue of more than three millions sterling per annum, exclusive of the taxes on all the additional produce besides. An object of such magnitude, is surely worth the attention of those, who have it in their power to bring forward so beneficial a measure. But as a preliminary and most essential step towards facilitating those improvements, good roads and navigable canals ought in the first place to be made, and every possible encouragement should be given besides, to promote and to accomplish so important a national concern.

SECTION II.

On Laying out, or fixing the Line of a Road.

General Rule.—In order to determine on the best possible line of a road, one general rule to be observed is, to adopt the shortest, the most level, and the cheapest line. Where these three requisites are combined, there can be no doubt but that line is the best.

From this simple general rule it might be inferred, that nothing is more easy than to stake out a new line of road, and that any person who can use a chain or a level, and make an estimate, is capable of this undertaking.

Circumstances however, may, and indeed generally happen, that will occasion a deviation from this general rule, and here the abilities of the surveyor are shown and brought into action.

The first requisite, for example, can very seldom be adhered to, for as the shortest distance between any two points is a straight line, it is perhaps necessary in the first instance to deviate from this, in order to avoid a hill, or a rock, or water, or some other obstacle that would occasion a great deal of expence and labour to overcome.

Perhaps also in making a road from the town A to the town D, Plate XL. fig. 1.

Plate XL.

Fig.1

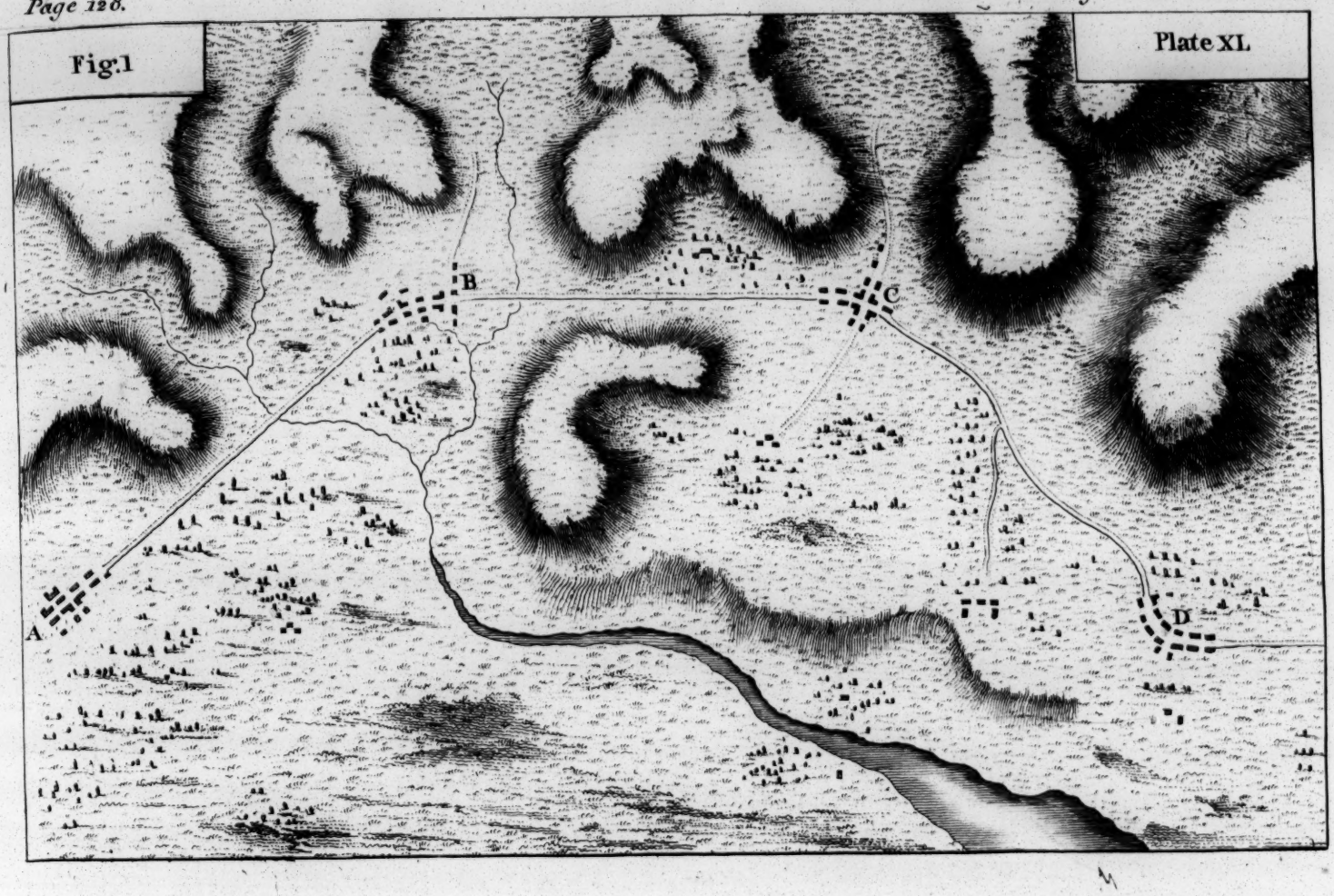
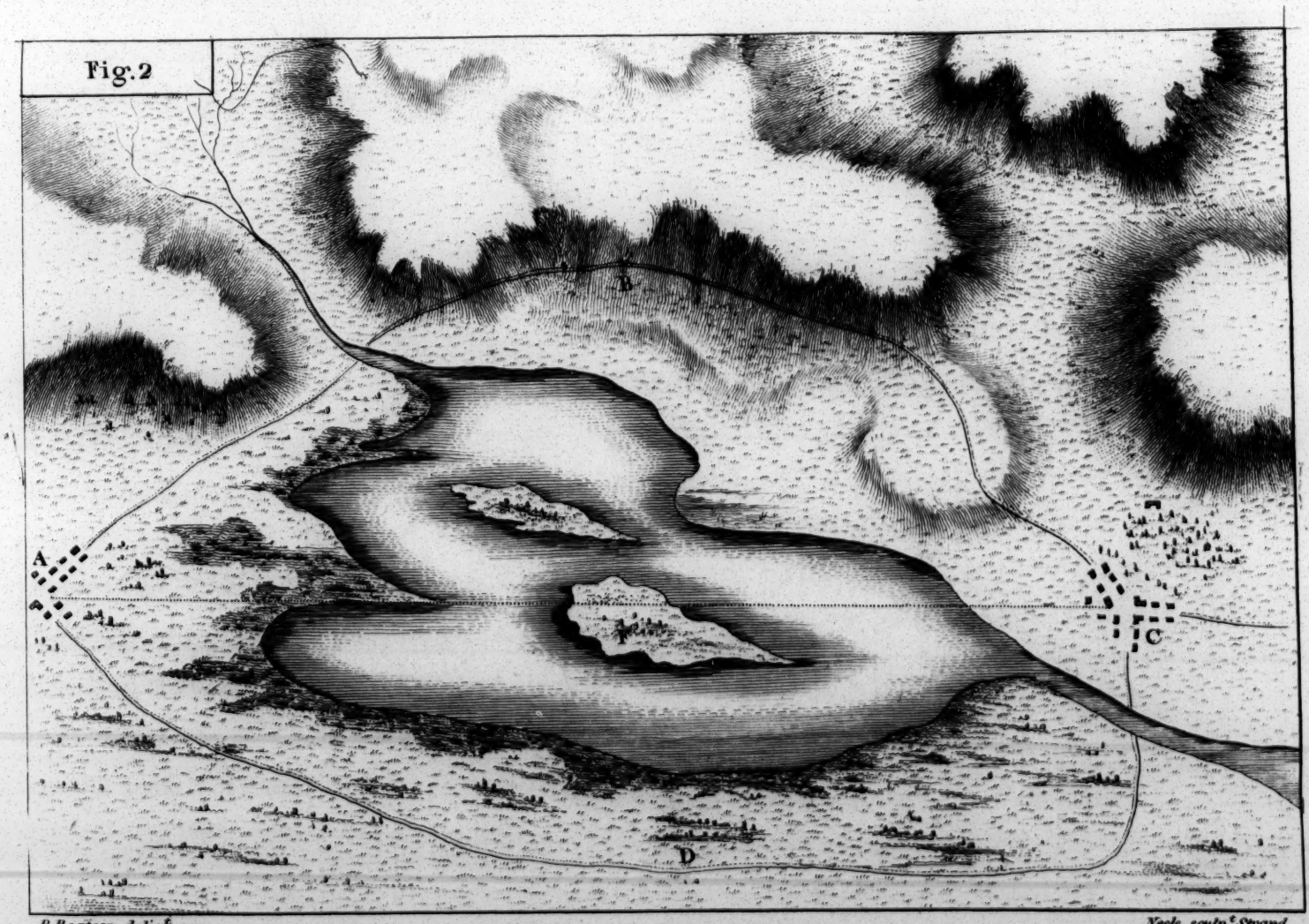


Fig.2



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the shortest line cannot be taken, it being necessary to carry it through the intermediate towns B and C. In this case the shortest line from A to B must first be settled, then from B to C, and lastly from C to D.

The next point to be considered is the most important of all, and perhaps ought therefore to be the first; that is the most level line. This point should invariably be adhered to if possible, even though the other two should in a certain degree be given up; for it is infinitely better to go a considerable way about to obtain a level road, than to go straight forward and be obliged to take an ascent; but it may in some cases be preferable even to ascend a gentle rise, in order to obtain a good hard bottom, and a road easily made, than to go on a level through a swamp or piece of water, which would require a much greater quantity of materials, be much more difficult to keep in repair, and occasion a great deal more expence. It is not the most hilly line to appearance that is always to be rejected as being the least level; for the steeper and shorter some hills are, it will be the easier to obtain a level road in that direction, by cutting down the summits, and laying the materials taken from them, in the vallies or hollow parts. To judge properly of this, and to make an estimate of the quantity of materials necessary to be taken from one place to lay in another, and consequently of the expence of so doing, is an indispensable part of a surveyor's duty, which requires some degree of attention; and yet it is surprising to see so many instances of negligence in this particular, and so many parts, in different roads through the kingdom, that are at present a very considerable ascent, which might with great ease, and at little expence, be remedied merely by taking from the highest part and laying it in the lowest.

The least expensive line is next to be considered. This point is also frequently given up in order to obtain one or both of the other two. From A to C, Plate XL. fig. 2, for example, the cheapest line would be to go along the foot of the hill B; the forming of the road affording at the same time plenty of materials to make it at a very small expence; but by going straight forward, through a morass perhaps, or over a river or piece of water, near one half of the distance will be saved, but there will be a considerable addition of expence, owing to the greater quantity of materials requisite, and the distance to fetch them, or perhaps the necessity of building a bridge. If, however, this additional expence is not very great, no person surely would grudge it (unless their funds were very scanty indeed), to shorten the distance so very much, and at the same time to have a level road. Again, in going

from A to C as before, owing to the great facility in obtaining materials, the cheapest way is as already stated; but in going that way, a very considerable pull is at the hill B, which, although the distance may be somewhat increased, and also the expence, may be avoided entirely, and a level road made by going another way, as ADC. The additional expence here, as in the former case, should be no obstacle, when the advantages of a level line of road are considered. But when both a shorter distance and a more level road can easily be obtained, as AFC, there surely can be no hesitation about expending even double the sum that another line would require, which possesses neither of these advantages.

From these few examples it must appear, that although the marking out of new lines of road may be reduced to three simple principles, which almost any person may form a judgment of, yet, from various circumstances, it is so often necessary to deviate from this general rule, it becomes a more complicated matter, than at first sight it appears to be. Much, therefore, depends on the skill and ability of the surveyor, who, before he finally determines on a line of road, ought to make himself perfectly master of every part of the intermediate and adjacent country; nor should he rashly determine at once, but should examine repeatedly, over and over again, whether no other line would be better than that he first thought of. He should even not think it beneath his dignity, to show to the neighbouring country people the line he is proposing, and ask their opinion of it; for in extensive tracts of country, these people, however ignorant they appear, may often point out what might escape the notice of many surveyors, who, perhaps, have neither had sufficient time, nor given themselves much trouble, to examine the ground so very minutely, as to make themselves fully masters of all the levels and distances, and other circumstances necessary to be attended to, in deciding on so important a matter, as laying down that line of road, which, when completed, will be the most advantageous to the public at large.

SECTION III.

Form of Roads.

THERE are various opinions concerning the form of roads. Some think they should be convex; others that they should be concave; others again that they should be quite flat from side to side, and in the form of inclined planes longitudinally; and some, that they should be quite flat in every direction.

Convex Roads.—The most common form is the convex, the rise in the middle being more or less according to the fancy or whim of the makers, but in general it is a great deal too much. This form is adopted on the idea, that whatever wet falls upon the road will run off towards the sides into drains or ditches made there for the purpose of receiving it. If the road were a perfect smooth hard surface, this theory would no doubt hold good, but in practice it is found not to be the case, for the wheels of carriages occasion so many ruts, and such a roughness on the surface of roads in general, that little or no water can run towards the side-drains, however convex the road may be. It consequently lodges in those ruts, and every succeeding carriage, the more easily makes them deeper, and works the materials and water together in such a manner, as very soon to render the road extremely disagreeable. This very frequently happens, even on roads that have been made most incommodiously convex, for the very purpose of keeping them dry; consequently, the convexity of a road, has not the desired effect of preventing water lodging upon the surface. Besides, it is extremely inconvenient for all wheel carriages, and destructive to the road itself, by making the loading rest unequally upon the wheels, unless when going on the very middle of the road, for the lowest wheel will always bear the greatest part of the burden, and therefore will injure the road the more in proportion. If a cart or any carriage with two wheels is loaded, we will suppose, with two tons weight; when that cart is upon a level from side to side, the load is equally divided, and each wheel sustains the weight of one ton, but if that cart is going on the side of a convex road, there will perhaps be the weight of a ton and a half upon one wheel, and only half a ton upon the other, consequently the lower wheel in this case will do the road as much injury, as if the cart were loaded with three tons upon a level, instead of two upon such a declivity. The proportion of weight upon each wheel, according to the declivity; will depend on the nature of the loading of the cart, for the higher the centre of gravity of the load is, the greater will that weight be on the lower wheel on the same declivity; and therefore a cart loaded with hay, or straw, or wool, or any other bulky commodity, will be more injurious to a convex road, unless when on the middle of it, than the same cart loaded with the same weight of stone, or lead, or iron, or any other weighty commodity which lies low in a cart: and nothing can be more injurious on such roads, than a stage coach loaded with outside passengers. But the destructive consequences of allowing carriages to heel much on any sort of road are even visible, though in a small degree, from the effect

produced by a wheel going over a stone, or any hard substance lying in one of the tracts or ruts, in which case there will soon be a deep hole formed by the wheel in the other tract, directly opposite to that stone or substance which raised the other wheel. Every precaution ought therefore to be used, to prevent carriages heeling to one side on any part of a road.

The inconvenience, and in many cases the danger, of going on either side of a convex road, makes all waggoners, carters, coachmen, &c. keep always on the middle, by which, on such roads, there is seldom any other part used by wheel carriages, however wide the road may be; consequently, by the carriages being always confined to the same tract, that part of the road soon gets out of repair, and requires a constant outlay of money to keep it in proper order.

The method of forming and making these convex roads, in the first instance, appears to me very absurd, as I shall endeavour to explain by the following section. Before any hard materials are laid on, the road is generally formed, as shown in Plate XLI. fig. 1. in which A and B represent the drains or ditches on each side. C C are the footways or horse roads, when made wide enough. These are also sometimes called the summer roads, on account, I suppose, of that being the only season they can in general be travelled upon. D E is a convex line, about 10 or 12 inches lower at D and E than the footway or summer road. After being formed in this manner, the hard materials, mostly consisting of broken stones, are laid on, which it is supposed will fill up that space, as shown by the dotted line, and when finished, the whole surface, from one side to the other, forms one convexity; the footways or horse roads being made a continuation of the same curve, as represented by that dotted line. This is still with the idea, that all the water that falls on the road, will run into the drains on each side. Let any person, in wet weather, take a view of a road thus formed, he will find, that in general, however great the convexity may be, the water will stand in every rut and in every impression made upon it, especially if the road has been so long travelled upon, that the stones on the surface are pulverized by heavy wheel carriages, and the wet earth from below worked up among them. If the road is but newly made or repaired, and the materials are sufficiently porous to let through the water, it will then lodge on the convex surface D E, in every impression of a stone or other uneven part, and particularly at the sides D and E where it is dammed again by the footways, and thus the bed or foundation of the road is kept constantly moist, and of course it will very soon go out of repair. By

Plate XLI.

Fig:1.

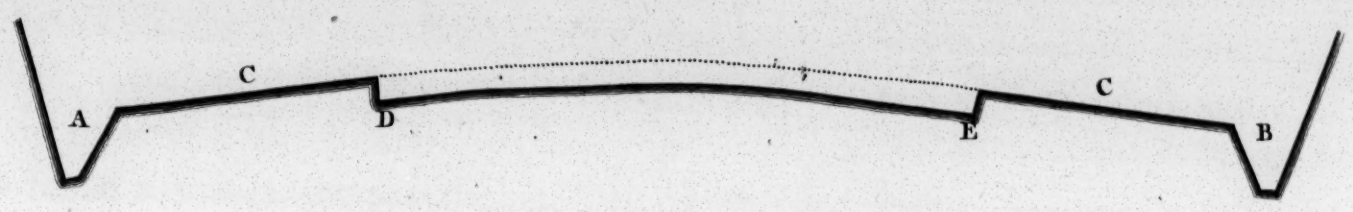


Fig:2.

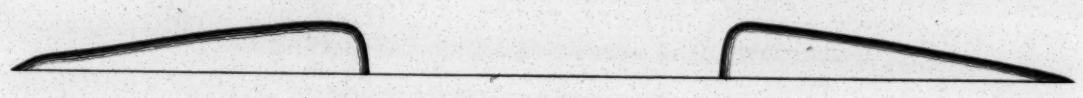


Fig:3.

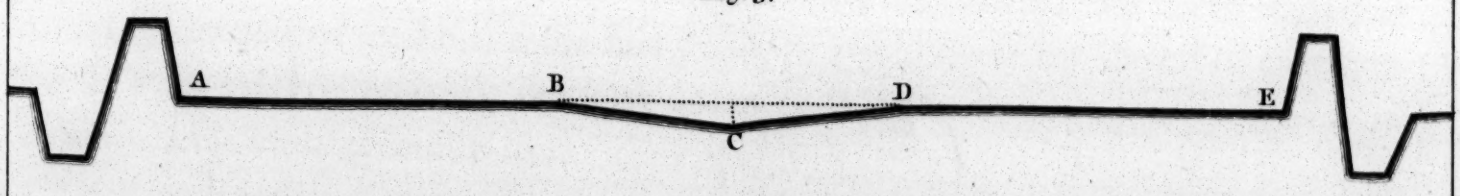
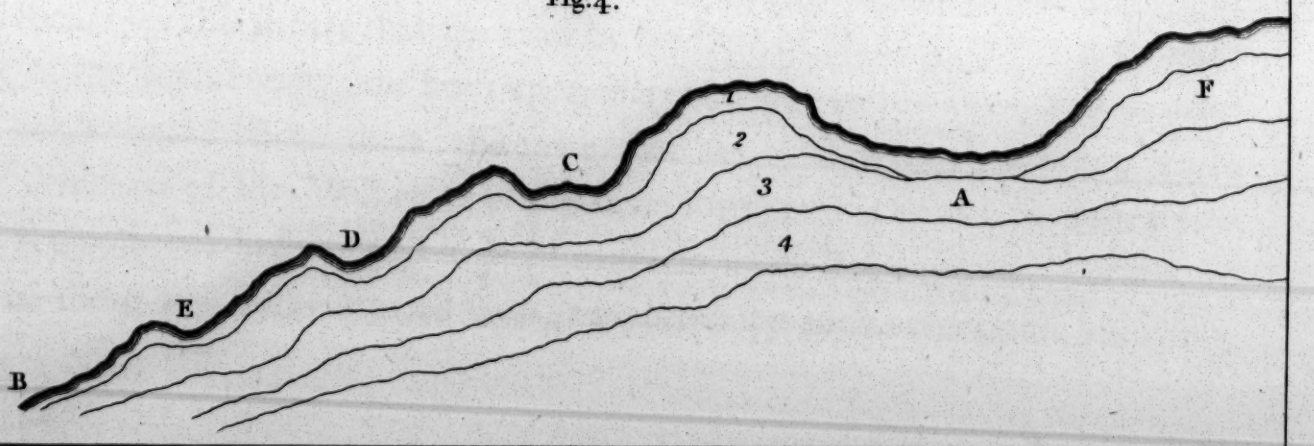


Fig:4.



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this continual moisture, the stones sink down into the soft earth of which D E is composed, and this earth, works up through the harder materials, and occasions all that dirtiness generally on the surface of roads in wet weather, although perhaps 10 or 12 inches in thickness of those hard materials had been at first laid over it. Sometimes indeed, there are under-drains made through the footways from the parts D and E, at every 10 or 15 yards distance, to convey the water into the ditches; but even this is not found to answer the purpose intended, for the intermediate spaces, soon become so impervious, that the water does not pass through them to enter these drains, the wet earth being converted into a sort of *puddle*, resembling what is used in aquatic works, for the purpose of preventing the moisture from penetrating through, and consequently it lodges in all the ruts and hollows on the surface.

Another manner of forming these convex roads, as recommended in the Bedfordshire Report, is shown in Pl. XLI. fig. 2. in which it is proposed to leave a hollow, or *vacuum*, as it is there called, in the middle, to deposite the hard materials in. The only difference that appears to be between this and the method already mentioned, as shown in fig. 1. is, that instead of the bottom of this hollow being made convex, it is made flat and also deeper. This method I conceive to be liable to the same objections as the former, perhaps even in a stronger degree; besides, it would require a much greater thickness of hard materials, which are very expensive, and those materials would be deepest or thickest in the middle of the road, where the wheels of carriages hardly ever go, consequently that part is not so liable to be cut up as the tracts in which wheels most generally run.

Concave Roads.—Concave roads are quite the reverse of the common form, being lowest in the middle, where other roads are generally made highest. By differing so widely from the common practice, and the general opinion of road makers, one would at first almost be inclined to suppose, that so singular a practice in forming roads, could only proceed from a desire or propensity to differ from the rest of mankind: but when we are told that the late celebrated and ingenious Mr. Bakewell, was an advocate for this form; that the road by his farm of Dishley, and that through Measham, in the same county, are both upon this principle, and in much better order than the roads round about them: likewise that the road through Bredon, made under the direction of Mr. Wilkes, is of the same form, and is said to be better now than ever remembered before, and kept in order at much less expence. When we consider of these well authenticated facts, supported by such respectable evidence,

we naturally conclude that the reasons for adopting this uncommon form of road, are founded on something more substantial than mere whim or caprice; it therefore becomes a subject well worth inquiring into.

From the severity of the weather, and the inconceivable badness of the cross roads, while I was in Leicestershire, in winter 1794, I regretted exceedingly its being quite out of my power to wait on Mr. Bakewell; consequently I had no opportunity of inquiring into this subject so minutely as I wished. At present, therefore, I can only remark upon what I was informed by others, and what is mentioned in the Leicestershire Report.

The manner of forming these concave roads before the hard materials are laid on, I have not yet learnt, but, when completed, I understand the form is something similar to the cross section, Pl. XLI. fig. 3. The whole width of the road A E is divided into three equal parts, or nearly so, A B, B D, and D E. The sides A B and D E are made quite flat. The division B D has a gradual but small descent, or concavity, from each side to C, which is the middle of the road. This concavity has also a small descent lengthways, made on purpose, if not declining naturally, sufficient to carry off the water to proper outlets. In the middle division B D, the best and hardest materials are laid. Mr. Bakewell's idea, I am informed, was that water, where it can conveniently be applied, should frequently be let run upon this concave part, in order to wash it quite clean; for it is always observed, where a small stream of water comes upon a road, that part, if the bottom is good, is generally firmest, and hardly ever gives way. To have a command of water, therefore, to flood the road at pleasure, he thought would be of great advantage.

The other advantages, I presume, attending a road of this form are these. There are three parts of this road, on which wheel carriages may go without heeling to either side. On the side divisions A B and D E, and also on the middle division B D, when the horses walk in the lowest part at C. This is certainly a material advantage, being much more easy for the horses, and less injurious to the road. By carriages using indiscriminately these three tracts, all parts of the road will wear more equally and for a greater length of time; whereas in the convex roads, there being only one part, namely the middle, on which carriages can go without heeling, that part only is most generally used, and consequently soonest gets out of repair.

Flat Roads, sloping longitudinally.—The advocates for flat roads sloping longitudinally, in the form of very acute inclined planes, say, with good reason, that by

being flat or level from side to side, the pressure of wheel carriages will be more equal, the friction less, and all parts of the road may be travelled on with the same facility; consequently it will wear more equally, be easier kept in repair, and require fewer materials.

These are undoubtedly great advantages, and worthy of attention; but to those unaccustomed to such a form of road, it will appear a difficult matter to keep it sufficiently dry.

It is already remarked, that the ruts made by the wheels of carriages *prevent* the water running to the sides of convex roads; it is therefore proposed that roads of the form we are now describing should have, in every level part, gentle slopes, sufficient for water to run along, which, supposing to be one foot in fifty, would hardly be perceptible. On these slopes, or inclined planes, the ruts made by the wheels of carriages would *promote* the water running off, by forming so many little channels or conductors for it to run into the lower part of these slopes, from whence it must be properly conveyed away. By this plan, it is said, such roads will be much easier kept dry than the common roads.

Roads quite flat.—The reasons assigned why roads should be made quite flat in every direction, are nearly the same as stated in support of the last mentioned form of road; only, it is observed, that as there are few parts of a country so perfectly level, for any considerable distance, that water will not run either one way or another; it is therefore unnecessary to be at the expence and trouble of forming those slopes or inclined planes, recommended in the preceding form; but that proper outlets should always be kept clear at every hollow part, and if the road should in any place be quite level, a shallow cross drain, that will occasion no impediment to carriages, at every 50 or 60 yards distance, or nearer, will keep the road sufficiently dry.

From what has been already said, it will appear, by these various opinions concerning the proper form of a road, that the main objects sought after are, 1st. To keep the road always as free of moisture as possible; and, 2. To construct it in such a manner as to render the draught or communication easiest at the least expence. In these are comprehended all the requisites necessary to form a complete road. To attain them in the best manner is therefore the important point. Four different methods have been stated, each of which has its supporters. The arguments in favour of each have also been shortly mentioned, which will show that their main object is the same, unless perhaps the idea of watering the concave road may be considered

a deviation from one part of the general rule; but as that is proposed to be done, only to wash the road occasionally, in case it becomes dirty or slushy, it cannot therefore, I presume, be considered in that light.

SECTION IV.

New Theory of Roads.

To differ from the generality of mankind, or to attempt pointing out any thing new upon a subject which has engaged the attention of many of the most ingenious men in the universe, may, to some people, appear a species of presumption that requires an apology. Nevertheless, as the sole aim of these observations, is to state what at least appears a rational way of forming and constructing roads, in order to attain and preserve those necessary qualifications which constitute a good road, I shall therefore proceed to explain, as briefly as possible, in what manner it is probable they may be attained.

From nature one may learn the most useful lessons in every situation in life, and in every project formed by the mind of man. On nature, therefore, I shall build my theory of making roads; for as yet it is but theory, having never, so far as I know, been put in practice.

Every person who has paid the least attention to the structure and formation of the different *strata* of the earth, must have observed, that some of these *strata* are of so close a texture as to be impenetrable to moisture; others again are so porous, that water will easily run through them in any direction, till it meets with some obstacle, or finds a vent. Of the first sort some are less dense, and of the latter some less porous than others, consequently, as they partake more or less of these qualities, the water or moisture will the more or less quickly penetrate through them.

To illustrate this more plainly, and to apply these principles to the construction of roads. Suppose Pl. XLI. fig. 4. the section of a hill or eminence composed of a number of *strata*, 1, 2, 3, 4, &c. If the upper *stratum* or surface soil, marked 1, is of a porous nature, it is evident that any water which falls upon it, will penetrate through to the *stratum* marked 2, where, if it can go no farther, it will glide along the surface till it finds a vent at the bottom of the hill B. If the *stratum* 2 is hollow

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Plate XLII

Fig: 1

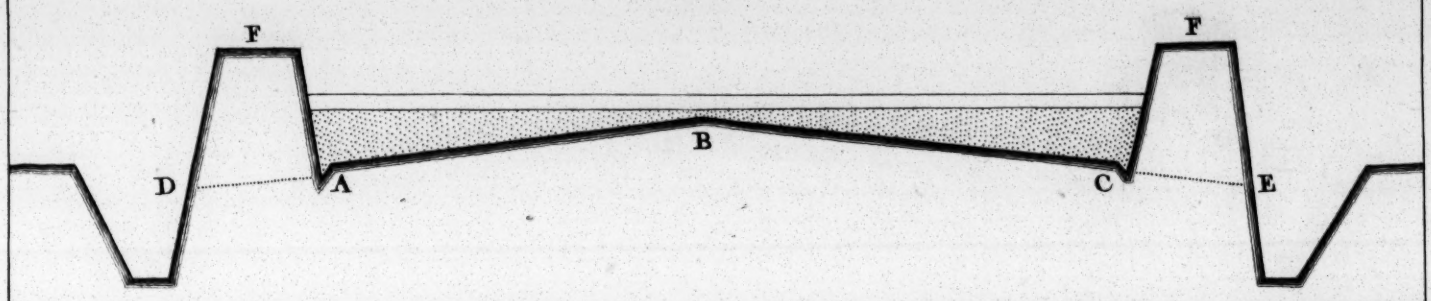


Fig: 2

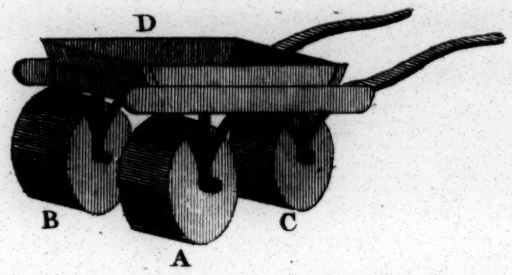


Fig: 3

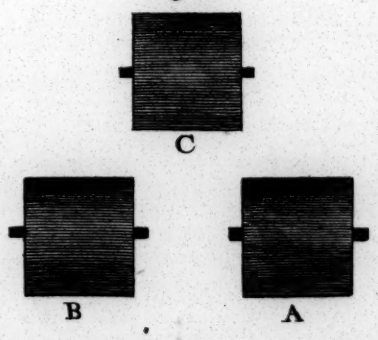
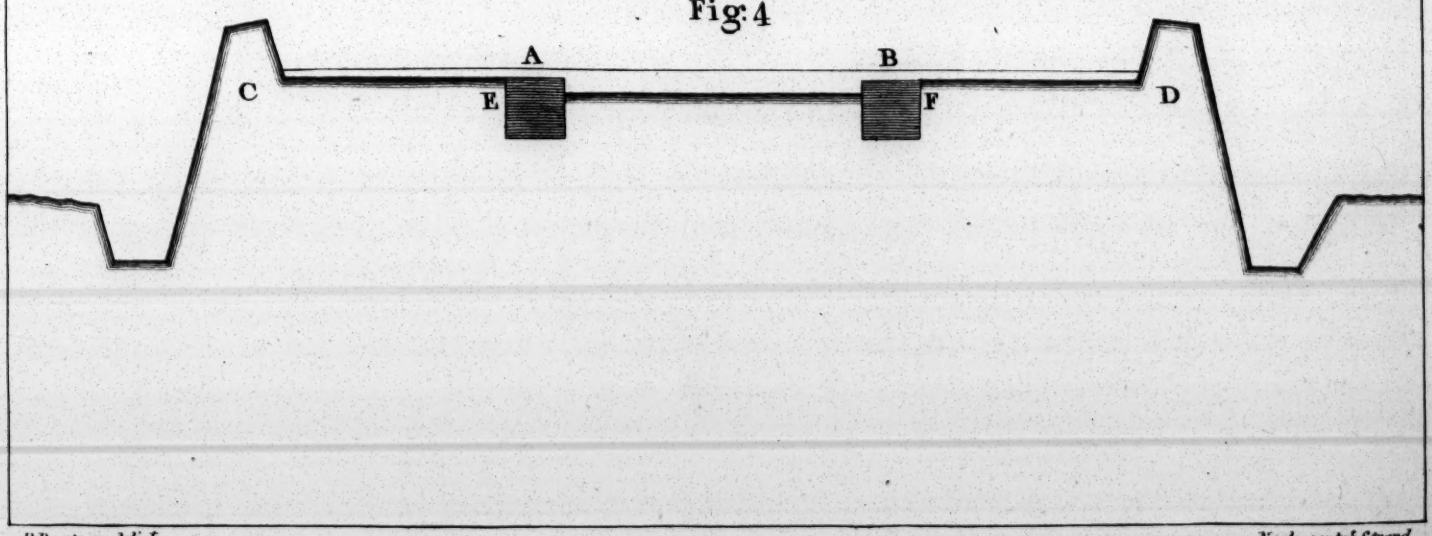


Fig: 4



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at A, and continues on towards F, the water will lodge in that hollow, and form a sort of pool or bog, as is sometimes observed on the tops of hills; but if in this hollow place, there is a communication with the porous *stratum* 3, as at A, no water will lodge there, but it will penetrate through and glide along the upper part of the dense *stratum* 4, till it finds a vent on the side or at the bottom of the hill as before. Hence it is an easy matter, sometimes, to drain bogs or pools on the tops of hills, merely by boring to a *stratum* through which water will penetrate; but where the water bursts out, or is supplied from below the surface, and it is wished to get rid of it, another plan must be followed, which very much depends on a proper knowledge of the different qualities of the *substrata*, as explained in another work, when treating on the new system of draining lately discovered.*

By the above figure it will also appear, that if the upper *stratum* 1, is of a close texture or clay, any water falling upon it will not only lodge in the large hollow A, but in the smaller ones C, D, E, and in all the other irregularities or concavities that may happen to be upon the surface. Hence, also, it is evident, that in order to keep dry the surface of any such piece of ground as represented in the figure, it matters not of what shape or form that surface is, or whether it is convex or flat, provided there is a communication with some under *stratum*, sufficiently porous to carry off the water below; but it is of some consequence the form of the upper part of that *stratum* upon which the water is to run, for the smoother it is, the water will of course the more easily flow away.

Construction founded on this Theory.—By these *data*, taken from the works of nature, it is obvious how to apply the same principles towards the construction of roads. In my apprehension it may be done as follows:—When a new road is to be formed, let it be done in the first instance nearly in the usual manner, with such materials as are on the spot, and the nearer the quality of these approaches to *clay*, so much the better. Instead, however, of forming it convex, as is generally done, let the lines A B and B C, Plate XLII. be quite straight, and meet in an angle or ridge at B, the middle of the road, having a slope from thence to each side of about an inch in a foot. A and C are small drains for the more easily conducting away the water that may be collected at those places. The road being thus formed, must be allowed to harden and settle for some time, before any other materials are laid on, great care being taken, while in that state, to let no carriages or cattle upon it, and

* See Practical Treatise on Rural Improvements.

it should be rolled with a long wooden roller, that will reach at once from A to B, or from B to C. This roller should be loaded with a box of stones to make it sufficiently heavy, and that it may be the more portable when that box is taken off; and it may be so contrived, that by changing the horses from one side to the other, there will be no occasion to turn the roller, in order to make it roll the same space over again. Being rolled in this manner, will consolidate the materials composing the ridge ABC, and prepare it for receiving those to come afterwards, for it is a most absurd practice, laying hard materials in the common way, upon this first form or basis of a road, before it is sufficiently firm to bear them.

Being thus formed and properly settled, the next step to be taken is to imitate the works of nature in dry soils as nearly as possible, by forming a *stratum* penetrable by water, composed either of *sand* or sandy gravel, or any other substance easiest to be got, that is sufficiently porous to admit water to pass through it. This *stratum* should be laid quite level, and extending from one side of the road to the other, filling up the small drains also, as shown by the dotted part in the figure. Over this are to be laid the best materials that can be got for completing the road, consisting either of stones broken very small, or of the best gravel. This coat of hard materials need not exceed above six or seven inches in thickness, which being much less than is commonly used, will be a considerable saving, and it may even still be less, if the directions hereafter given are strictly attended to. If this covering consists of broken stones, they should afterwards be laid over with sand or fine gravel when easily procured, so as to fill up all the cavities betwixt them. The sand or rubbish from a freestone quarry is excellent for this purpose, provided there is no mixture of earth in it, which should be carefully guarded against in every step taken after the road is first formed. These finishing materials being properly laid on and smoothed with a rake, the whole should now, before any carriages or horses are admitted upon it, be well rolled with a heavy iron roller, divided in three parts, and constructed as shown in Pl. XLII. fig. 2, where A and B represent the two hind divisions of the roller, and C the front or middle division, to the framing of which the shafts are fixed, and so contrived that it turns in the manner of the forewheels of a waggon. D is a box for holding stones to increase the weight when necessary, but in adding this weight, it must be observed, to lay about two-thirds of it over A and B, and only one-third over C, otherwise the pressure will not be equal. Fig. 3 is the plan of the roller, showing the manner of its standing on the ground. A and B being the back, and C

the fore or middle division. Iron rollers are sometimes made in three parts as above, but being all in a line, and close together, are apt to be choked by gravel and small stones, which cannot happen in the construction here recommended. If such a roller were generally used upon roads, especially when newly made, it would save a great deal of expence in repairing them; for it cannot be expected, that any new road will immediately bear wheel carriages, or continue long in repair, when composed entirely of loose materials, without the smallest pains being taken to consolidate them together. Frequent and heavy rolling would therefore produce the most beneficial effects, and would tend very much to keep the road free from deep ruts and holes; besides, there is nothing could contribute more effectually to promote and preserve firmness and solidity, two qualities without which it is impossible any road can, with propriety, be called a good one.

Advantages of this Construction.—The advantages of a road formed and constructed in this manner, are as follows: by being level on the surface every part of it is equally commodious for carriages, consequently it will all be equally travelled upon, and the deep ruts so frequent in other roads will almost entirely be prevented.

It will therefore be much easier kept in repair, and, if properly managed at first, will be made at less expence than the common roads, especially in a sandy soil, or where sand or gravel is easily procured. The draught will be much easier on such a road. And one very important advantage is, by having an under *stratum* through which water can penetrate, and the cavities among the harder materials being filled with the same porous substance, no water can ever lodge on the surface, nor can it ever become so dirty as other roads are in wet weather; all the water that falls on the surface, unless perhaps in very heavy rains, being conducted away underneath, and in every part. It may here be observed, that from the small drains on each side of the road, cross drains, as D and E, should be carried through the fences marked F, provided the level of the ground will admit of it, at the distance of every ten or fifteen yards. These cross drains may be made of wood, with about an inch bore, or of stone, if preferred.

It would be of great advantage to this sort of road, as well as to every other road where the ground is inclosed on each side, that the fences should be sunk towards the fields, as shown at D and E, and the water to be conducted through to these sunk fences, instead of the common method of leaving large open ditches and drains on each side of the road. It must also be particularly attended to, that on all sloping

roads, on a declivity where the water is apt in heavy rains to run upon the surface, or at the sides, that it ought never to be allowed to run in the same direction more than ten or fifteen yards, but at that distance to be conducted away to a side into the main drains. It will then do little or no harm, as it can never increase beyond a very weak stream; but if it is allowed to run one hundred or two hundred yards, it will probably be increased to such a size, before it reaches the bottom, that it will wash away a great deal of the materials, and may besides very much injure the road or the fences on each side of it.

A road on the construction we are now treating of, need not be quite so wide as roads in general are made, for the whole surface of it will be in use from one side to the other, and therefore from twenty to twenty-four feet wide is quite sufficient, unless near populous towns or extensive works, where great numbers of carts or waggons are employed. In the interior parts of the country, twenty feet in width will answer every purpose required. I have observed in several places where the roads have not been above eighteen or twenty feet wide, and properly made from side to side, that they were in much better condition than the neighbouring roads, from thirty to forty or fifty feet wide. On these wide roads, formed in the usual way, there is seldom more than eight or ten feet in the middle of them, generally, made use of. The remainder, on each side, being occupied by heaps of stones, scrapings, and other rubbish, which although they may partly be of use sometimes in repairing the roads, ought on no pretence to be allowed at all times, or at any time to lie there; such rubbish being not only disgraceful on the sides of a public highway, but even dangerous, particularly in the dark, for either carriages or horses. What an immense deal of valuable land is thus foolishly and uselessly occupied, merely for the convenience of road contractors and their dependants; or perhaps, what is even worse, and often productive of the most serious losses to the neighbouring farmers, is, that these untrodden parts of the public roads, are allowed to be over-run with thistles and other noxious weeds, whose downy seeds when come to maturity, are wafted through the adjacent country by every breeze, and fill the farmer's fields with their pernicious produce, however industrious he may be to prevent it.

Throughout the kingdom at large, I make no doubt, there are thousands of acres of fertile land thus lost to the community, merely by making roads so much wider than necessary. Near populous towns, the roads should unquestionably be of a suitable and convenient wideness: perhaps thirty or forty feet. Near the metropolis, they

are in some parts with great propriety much more; but to make roads forty or fifty feet wide, as is sometimes the case, through a thinly inhabited part of the country, or near the most pitiful villages, where even twenty feet would be sufficient, is a mere waste of ground for no purpose, and occasions a very great additional expence in making such roads, which certainly might be avoided.

Suppose the medium necessary width of roads to be seven yards, or twenty-one feet, and that the medium width now made is eleven yards, or thirty-three feet: this is, upon that supposition, four yards wider than is necessary, which in every mile is a loss of one acre, one rood, and two perches; and supposing there are 5000 miles of such roads in the whole kingdom, here is a loss of more than 6300 acres, which if estimated the same as the improved value of the waste lands, at 27*s.* per acre, and at thirty years' purchase, would produce £ 255,150. a sum, which if laid out in improving the roads, and making easy communications through different parts of the kingdom, would be of the greatest public advantage.

SECTION V.

Roads through different Soils.

Through a sandy Soil.—Where the soil is of a sandy nature, roads may be made on the construction recommended in the last Section, with the greatest ease. In such a soil, there will be nothing more to do, than to level the surface properly, fill up all the hollow parts, roll it well with the long wooden roller, and lay on the materials intended to finish it with, as before directed, and then roll it with the heavy roller.

If the soil should consist entirely of a deep loose sand, the best and easiest way to make a lasting road through such a soil, is to form it to the width intended for the hard materials, at each side of which, as at A and B, Plate XLII. fig. 4, let a channel be dug of at least eighteen inches in depth, and about the same width; let these be again filled and firmly built up with strong turf or clay, or any other solid substance that will prevent the materials to be laid on the road from spreading to either side, openings being left at every ten or fifteen yards to let the water that falls on the middle part of the road more easily through. Where the form of the ground requires making up, a little wall of the same nature, instead of digging a channel, may be built

on each side, nearly as high as the surface of the road is intended to be, as shown at E and F. These will prevent the hard materials laid on from spreading, which is the principal cause of roads made in such soils giving way in so short a time; neither will those materials be so liable to sink into the sand, if it is properly rolled before they are laid on, as well as at different periods after it is finished.

If there is a fence on each side of the road at C and D, and that materials can be spared to cover it from side to side, there will be the less occasion for the little walls A and B, as these are only intended to keep the hard materials within the bounds prescribed, in case it is not judged proper to lay them the whole breadth of the road. If, however, those walls are thought requisite, the spaces AC and BD, by being covered with a little gravel or freestone sand, will make very good footways or horse-roads; but, indeed, in a road finished in this way, there will be no occasion for horse-roads distinct from the main road, as the whole, if kept in proper order, will be sufficiently smooth and safe for horses, or even foot passengers to go upon.

Roads through a Clay Soil.—The roads made in clay countries are in general the most disagreeable of any, chiefly on account of proper precautions not being taken to prevent the water lodging on the surface. Sometimes perhaps owing to a want of proper materials, such as stones or gravel; but I have often seen the very worst of clay roads, even where no such excuse could be given.

It seems hardly ever to have occurred to those who had the direction of such roads, that *sand* properly applied would in a great measure remedy all the defects complained of; and there are few parts of a country where sand of some sort, or freestone rock, or sandy gravel may not be obtained by some means. In certain situations it may, no doubt, be more expensive and difficult to procure such materials than in some others; but these are local disadvantages which road makers must lay their account with: but the excessive inconvenience of bad roads, the expence occasioned by the tear and wear of wheel carriages and harness, the risk of dislocating the limbs of horses, together with many other disadvantages, ought to stimulate all concerned, to exert their utmost endeavours, to make the roads good and easily passable, be the difficulties what they may.

In such places, where no hard materials can be got, if the road were formed nearly in the same manner as already described in Plate XLII. fig. 1, the evils complained of might probably soon be remedied. The clay should be excavated so as to form a ridge in the bottom of the excavation, as ABC. The dotted lines CD and AE,

are small openings or drains at every ten or fifteen yards, or at every hollow place, to conduct away the moisture into the main drains D and E. If this excavation is then filled with sand, or any other porous matter easiest to be got, and finished as formerly directed,* there is no doubt but the road would soon become as good as could be wished for. Something similar to this I have known put in practice by a very ingenious gentleman in Cheshire, on whose estate, being a strong clay soil, the roads were so excessively bad as hardly to be passable. He dug away the surface of the road to the depth of twelve or fourteen inches, and having the command of plenty of sand, he filled up the excavation therewith, and covered the whole with gravel, by which means he has now made, so far as completed in this manner, as pleasant a road as one would wish to travel on. I am not certain if he left the bottom of the excavation with a ridge in the middle, as here directed; but I am clear this would be an advantage, as well as the outlets at certain distances, to let away the water. I rather suppose the excavation he made was of the same depth from side to side.

Roads through a boggy Soil or Morass.—It is almost unnecessary to mention, that to make a road through a bog or morass, the first step to be taken is to drain off as much of the water as possible, by deep ditches or drains withinside the fences, if inclosed, or intended to be inclosed on each side. These drains should be cast at least a twelvemonth before any thing else is to be done towards making the road; for if the place is very boggy, it will be found to subside considerably after the water is drained away, and some parts will subside more than others, in proportion to the depth of the mossy soil, and to the quantity of water lodged there. Those parts will therefore be the better seen the second season than the first. All hollows or irregularities should then be filled up and levelled, either by taking from the heights and filling up the hollows, or by some other proper materials nearest at hand. In either case the surface sods should, with a push-plough or paring-spade, be carefully pared off the heights to be lowered, and also off the hollows to be filled up. These sods should be laid aside till those places are brought to their proper level, and should then be laid on again. This will make the whole surface of an uniform toughness, which it would not be were the sods not laid on

Having proceeded so far, and the breadth of the intended part for receiving the hard materials being marked off, let that part be now covered with sand, or such porous substance, as before recommended, to the thickness of at least ten or twelve

* Page 138.

inches. Roll this, and finish it as already directed, and there is no doubt but a road made in this manner may be as good through a moss as in any other situation. This I also speak of from experience, having seen the most pleasant roads made in this manner, through mosses formerly thought impassable. When the moss is too soft to admit horses upon it, the sandy *stratum*, if it will not bear horses, may be rolled by men, the weight of the roller being regulated by the stone box according to their strength. Sometimes, indeed, the rolling is altogether omitted, but it is much better to roll when practicable.

There are other methods of making roads through mosses, as by laying a foundation of broom, furze, or heath, and then the hard materials above them; but sand is greatly preferable where it can easily be got, and when the tract of the road is properly drained, as it ought to be before any thing is laid upon it.

Respecting the mode of making roads through other kinds of soils than those already specified, it is unnecessary to offer any particular directions thereupon, as the rules and principles here laid down may be applied to any other kind of soil or situation, as well as to these, varying only perhaps in some respects, according to the different qualities of the materials, or to local circumstances, which will often occasion deviations that must entirely depend on the skill and ingenuity of the surveyor.

SECTION VI.

Roads on the Sides of Hills.

THE roads we have hitherto been treating of, have been supposed on ground about an equal height on each side of the road, that is, nearly level from one side to the other; but when cut or formed on the sides of hills, some other precautions are necessary to be attended to.

In making such a road, it frequently happens that the excavation affords a sufficient quantity of materials for that purpose; and the part DC, Plate XLIII. fig. 2, cut out of the solid, very rarely requires any covering laid upon it. This, however, depends on the nature of the soil. If the whole breadth of the road is formed from the solid, and that is sufficiently hard, no extraneous materials will be neces-

Plate XLIII

Fig.1

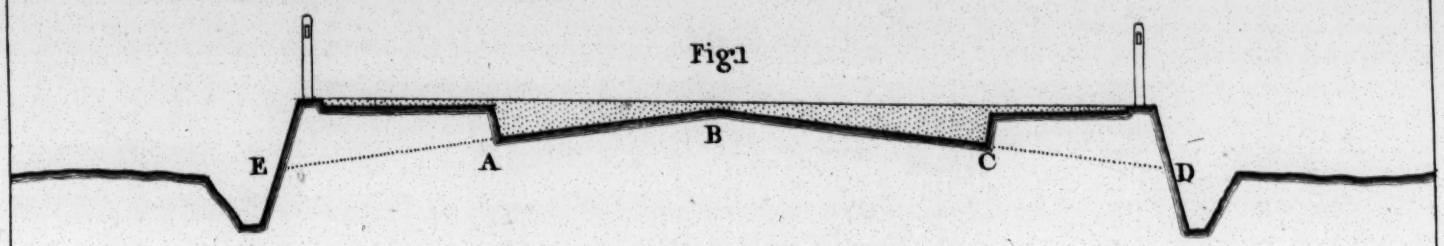


Fig.2

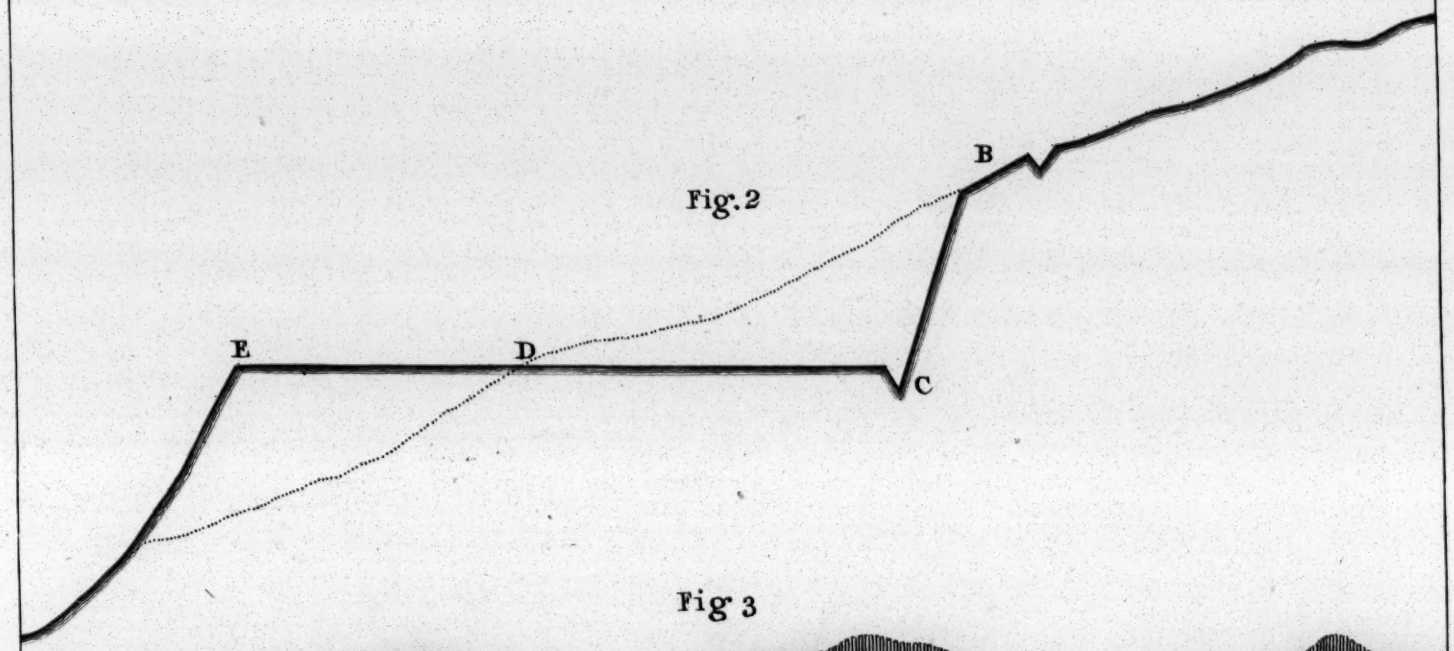


Fig 3

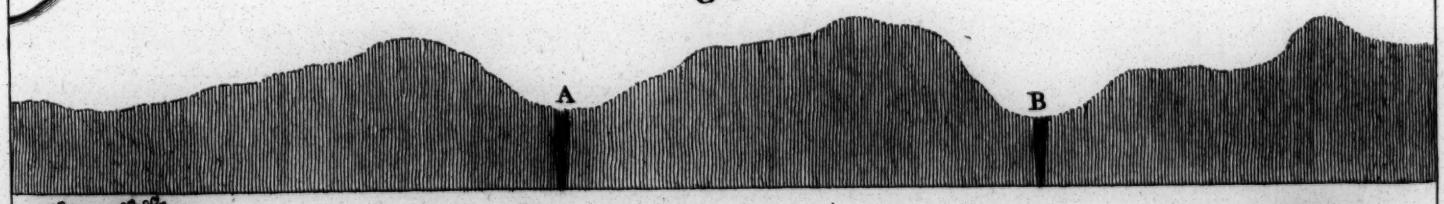
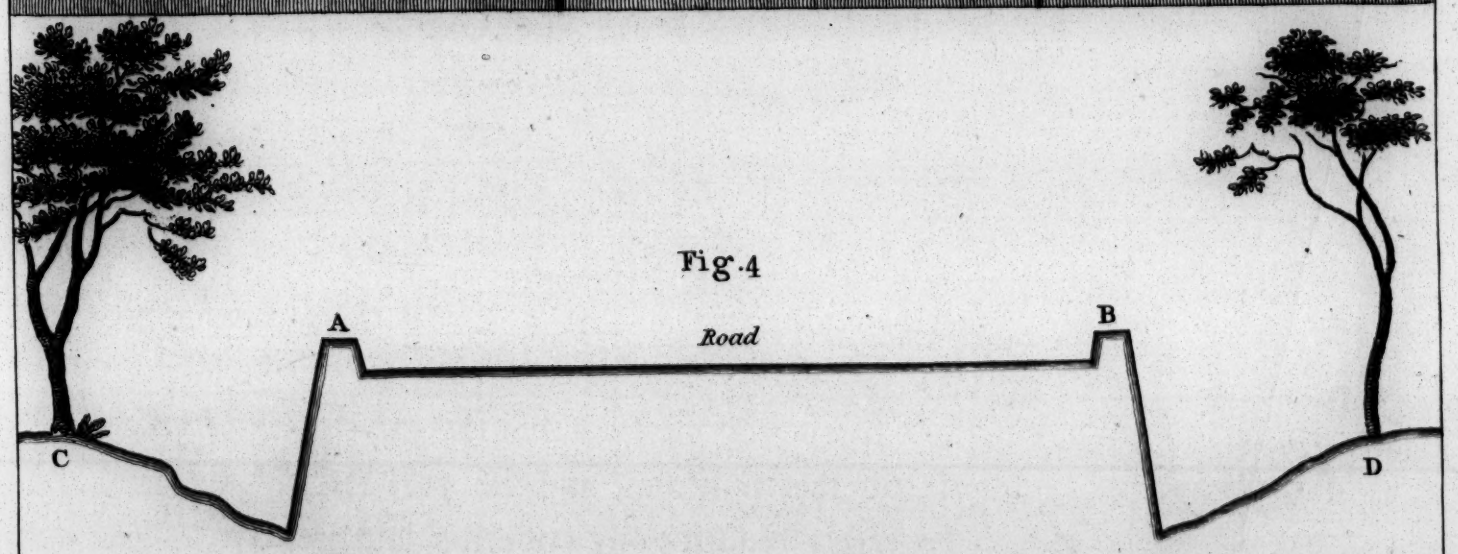


Fig.4



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sary, but if the soil is a compound of clay, or of a soft nature, the directions and rules already given must be applied.

If the part DE is made up from the excavation, it ought to be formed considerably higher at first than the part DC, as it will naturally subside for some time afterwards, and the hard materials should not be laid on till it has had sufficient time for that purpose, which may be greatly expedited by rolling; and it should be observed, that it is much better to be obliged to lower that part to its proper level before the materials are laid on, than to be under the necessity of making up any of it.

If the hill is of a considerable height above the road, a good deal of water will sometimes come down. In this case it is in general best to intercept that water at some little distance from the side of the road, than to allow it to run down the face of the bank BC. If allowed to run down this face, it will very soon moulder it away, especially in frosty weather, and will always choke up any drain that may be made at C, whether covered or open; for if covered, the earth that moulders down will in a short time become so close, that water will not get through it to the drain before it runs off upon the road; and if open, it would be extremely difficult and troublesome to keep it clear. In this case, by intercepting it at B about four or six feet from the brink, and conducting it away to the most convenient outlet, it would be much easier to keep the road dry. If the face of the bank is irregular, the water may still be conducted away by making the drain B recede from the brink at such places, and keeping the course always on a proper level; or it might be let off at every hollow place by small recesses faced up with stone, or by wooden spouts sunk upright in the bank at every such hollow, as at B and A, Plate XLIII. fig. 3, to conduct the water from the upper drain to a cross covered drain below the road, by which it will be carried away at the lower side.

In forming and making these, as well as all other roads, it must always be carefully attended to, the preventing of any water running on the road, except what falls on it from the clouds. Where this cannot easily be done, and where it is necessary to allow a stream to run along the side of a road, the drains or ditches, which as before observed, should be withinside the fences, must be made of a proper size accordingly, for the small drains filled with sand or gravel, as already recommended, are only meant for such roads as can have no extra water upon them.

SECTION VII.

Fences on the Sides of Roads.

THE nature of the fences on the sides of roads is very necessary to be attended to, for on these the goodness of the road, and the expence of upholding it very much depend. Where the form of the ground and situation will admit of it, the sunk fence facing from the road, that is, with the deepest part towards the field, is by far the best. A fence of this sort in the form of a ditch or drain, may be made of any depth without the least danger or inconvenience, which is not the case when open to the road; and the deeper it is made, the better effect it will have in keeping dry the foundation of the road, if properly constructed, nor will the road require to be so wide as usual, at the same time there will be fully more room to travel on; for if the fences are of this kind, the whole width of the road may with safety be occupied, but when open to the road, a considerable space is lost, by the fear or danger of approaching too near them.

The fences on each side may either be of stone, sod, or a hedge or paling; but ought not to be more than eighteen inches, or two feet above the level of the road (except a paling), and the top of them, if broad enough, may in some places be made to serve as a footpath. Nevertheless, the fence towards the field may be six feet in height, or as high as the purpose of it requires. The road will thus receive the whole benefit of the sun, which is very essential towards keeping it dry, as well as the depth of the drains or ditches withinside the field, to which there must be proper openings at certain distances, as before recommended; and in winter after heavy falls of snow there will be little chance of a road fenced in this manner ever being blocked up, for it will be observed, when a storm of snow is attended with a high wind, that the drifted snow lodges chiefly about the fences, or where it meets with an obstacle to occasion an *eddy*; for where high fences are on the sides of roads, they are almost to a certainty in such cases, blocked up, to the great inconvenience of the whole neighbouring country.

If rows of trees are permitted to be planted near the road, let them be at C and D, Plate XLIII. fig. 4, ten or twelve feet distant from the fence. The expence of

rearing, which will be very little more than in hedge-rows (which ought on no account to be allowed on the sides of roads), for the sunk fence will be an immediate protection on one side, and a paling will as easily be made to protect the trees on the other as in a hedge-row. But when trees are planted on the side of a road they should be at least forty or fifty feet distant from each other. At the same time there can be no doubt of its being better for the road that there are no trees at all near it; but if they are planted as above, and in such a position as will not overshadow any part of the road for three or four hours before and after mid-day, any injury they can do will hardly be perceptible.

SECTION VIII.

Repairing Roads.

It is a very great error, and productive of a vast deal of unnecessary expence, the allowing a road to go much out of repair.

Where the funds will admit (and in general it would be a great saving) proper persons should be appointed in every parish or district, or to have the charge of a certain length of road, to observe frequently if any part is giving way, and to repair it immediately; and particular care should be taken to prevent water lodging in any hollow part, or in the tracks of carriages. And those hollow places or tracks should immediately be filled up with proper materials, when the water is completely drained off, but not before, as is too often the case. Sometimes such tracks may easily be effaced, without being filled up, merely by removing the sides of them; but as these sides generally consist of an earthy substance that has been thrown out by wheel carriages, it should, on no account, if of that nature, be laid again in the tracks, as that would make but a very superficial repair, and would soon be as bad as before. Nor should any large stones ever be allowed to lie on the surface of the road, or even near the surface, unless the whole breadth of it is equally hard; for, as already observed,* wherever one wheel of a carriage goes over such a stone, especially if a little above the surface, the other wheel, by having the greater part of the burthen thrown upon it, will cut a deep rut directly opposite, unless that part is equally hard or firm, con-

* Page 132.

sequently every thing that tends to make any carriage or waggon heel more to one side than the other should immediately be removed; and for the same reason, if any part of the track on one side is growing deeper than that on the other, it ought without delay to be filled up. These cases will happen chiefly on convex roads, or where it is the absurd practice of all waggoners and carters, to follow constantly the same track, which they could have no pretext for doing if roads were formed and constructed as herein directed; but so bigotted are the people in many parts of the country to this foolish custom, that all the axletrees of their wheel-carriages are made exactly the same length, for the very purpose of following one another, as if it were considered a beneficial practice both for the roads and for the ease of the horses. But in my humble opinion the reverse should be the practice, and where that custom prevails the axletrees of all wheel-carriages should be made of different lengths, for the very purpose of *preventing* them following the same track. That is, if one parish were to have them of a certain length, another parish an inch longer, another two inches longer, &c.; and perhaps it would be the best way to make the extreme lengths in contiguous parishes, so that the shortest should be in the parish next the longest, &c.

If the foregoing directions were rigidly attended to, and every appearance of a breach or defect at once repaired, the same materials when displaced, would very often, if properly relaid, and fit for the purpose, repair the part beginning to fail; whereas if neglected for some time, and allowed to get much out of repair, it will probably require a considerable additional quantity of materials, and thereby occasion a great deal of expence that might have been saved.

The summer season is the best not only for making but for repairing roads, nor ought they on any account to be touched in winter, unless to give a temporary aid to some sudden breach that is perhaps almost impassable, or to let off any standing water, as before recommended. Yet nothing is more common than to see a number of labourers employed on the highways in winter, when the days are short, and but a few hours labour can be obtained of them. Indeed so little attention is there often paid to repairing the highways, that sometimes old infirm people are employed for this purpose, as if repairing roads were a sort of trifling bye job, merely for the employment of paupers, or lame, miserable objects, who can get no other means of subsistence. In one of the most beautiful and opulent counties of England I have seen; on the 30th of December, such people employed on the highways, without

appearing to have any person superintending them, consequently idling away more of their time talking to one another, and staring at every carriage or other object that passed, than attending to their work. I must, however, in this instance, make one exception, and do justice to an old infirm man who was leaning on his crutches, and seemed very busy applying the little strength he had in uplifting a hammer, to let it drop again among a heap of stones; for he seemed to be too far gone to give the hammer any additional *impetus*, more than it acquired by its own weight in descending.

During the time of hard frost it may, no doubt, be very proper to drive materials and lay them down for the purpose of being at hand to repair the roads when the season permits, but such a time is the most improper of any for applying those materials.

In laying down materials for repairing roads, it is a very general practice to lay them in small heaps along the sides of the road, and even encroaching sometimes very much upon the space allotted for travelling on. This ought on no account to be allowed (unless those materials are to be immediately used), for reasons so obvious it is unnecessary to mention them. It would be much better to have recesses at certain convenient places, for the purpose of laying the materials in till wanted; by which means the inconveniences attending the common way would be totally avoided; and travellers might then, without interruption, use any part of the road they found best; and besides, there would then be the less occasion for making the roads so wide as they are generally made, which would undoubtedly save a great deal of money in keeping them in repair.

Rolling of roads with a heavy roller, as before recommended, would be a very beneficial practice for keeping them in good repair, especially if the hard materials that are worked out of place by the wheels of carriages, are raked in again previous to the roller passing over them. This would be an easy and expeditious operation, and if taken in proper time, would in many cases be all that is necessary to put the road in repair.

Different machines have been invented for dragging over roads, when much out of repair, to replace the stones or gravel disturbed by wheel carriages, particularly a sort of harrow, invented in the year 1786, by Mr. Harriott of Great Stambridge, in Essex, for which he received a premium of ten guineas, from the Society for the encouragement of arts, manufactures, and commerce.

This harrow will be best described by a figure, Plate XLIV. fig. 1, and the following extract from Mr. Harriott's letter to the secretary of that society.

" Being appointed surveyor for the roads at Michaelmas, 1786, and finding them very bad, I provided a sufficient quantity of stones and gravel against the next summer, to cover the roads pretty thick; but when so done, I found the heavy loads of chalk, gravel, and corn soon turned the stones out, and made almost as deep a rut or rake as ever. Stubbing the quarters in, I found an endless job, as well as a great expence, I therefore contrived the road-harrow, of which this is a model, and by the help of which I have during last summer, at a very trifling expence to the parish (after the ruts were again filled up with stones), kept the roads in extraordinary good condition. A man, a boy, and two horses will do three miles in length in one day, completely harrowing down the quarters, and drawing the stones together, which, by means of the mould-boards, are dropped into the ruts far better than a man can stub them in. Now if a man was employed to stub, he could not do it for less than a penny per rod,* (the most common price is three halfpence or two-pence per rod, if they stub the outside as well as the inside quarter) which would amount to one pound six shillings and eight-pence for one mile in length, consequently to four pounds for three miles, which the road-harrow will do in one day; and for which I charge the parish for man, boy, and horses only eight shillings." Mr. Harriott further says, " that it does the work better as well as cheaper, that several other parishes are using them, and thinks the use of them will soon become general, especially where roads are mended with gravel. The head of the harrow is three feet long, from outside to outside of the bars. The bars four inches square, and the length of them five feet. The mould boards extend eleven inches farther, which is necessary to draw the stones (which the teeth of the harrow work up to the top), nearer the middle of the road. The mould-boards are four feet two inches long, ten inches deep, and two inches thick, they are shod with a bar of iron, and lined about six inches high with an iron plate. The teeth (which should be steeled at the points) are one foot in length, from the underside of the bars to their points; they are one inch and quarter square, and are fixed with strong nuts and screws, with collars both on the under and upper side of the bars. The bars are made to go lengthways instead of across, to prevent them from splitting. The harrow is drawn by two horses abreast; a boy leads the outside horse on the outer quarter, the other

* Of sixteen feet and a half.

G.R. III.

Plate XLIV

Fig. 1

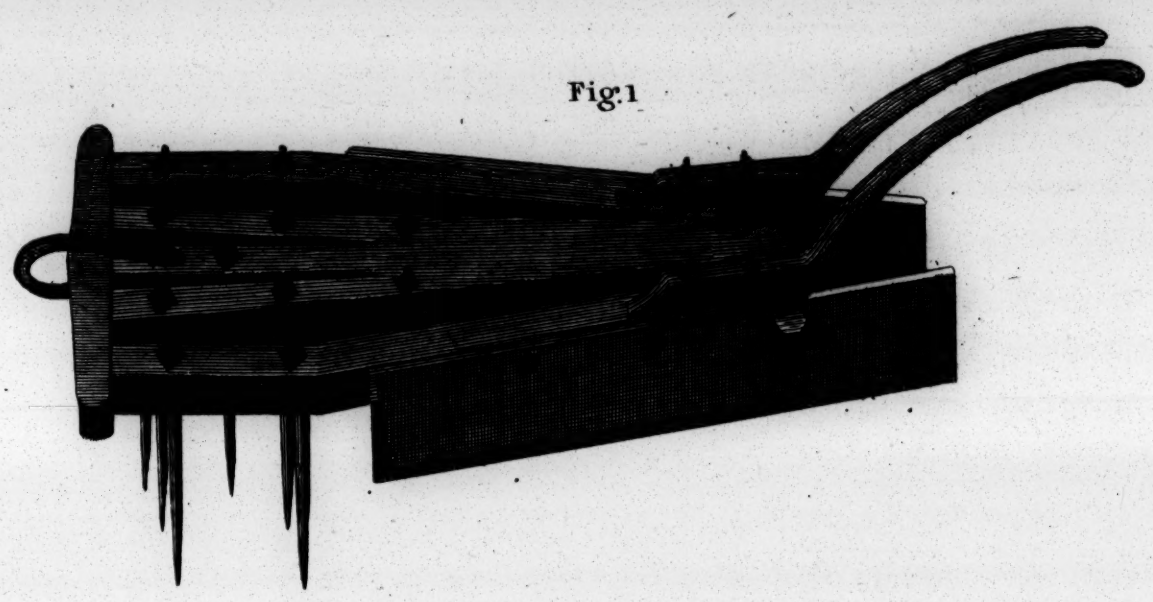


Fig. 2

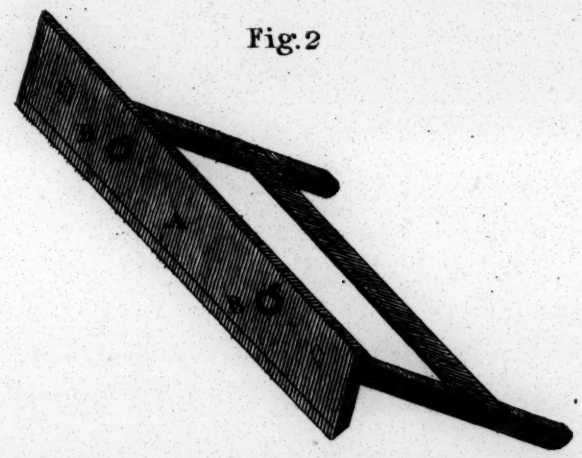
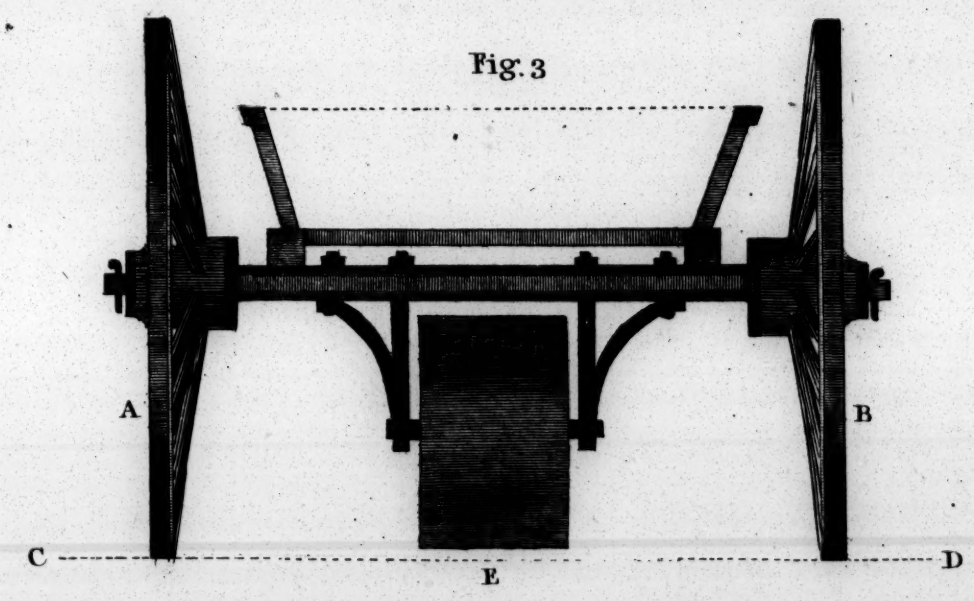


Fig. 3



R. Beatson delin.t

Neele sculp.t Strand.

horse goes on the horse-path, the man steadying the harrow by the handles. Of course they take one inside, and one outside quarter as they go, and the other two quarters as they come back." This harrow is certified, by several people in the parish where it is used, to do more work with one man, a boy, and two horses in one day, and in a much better manner, than could be effected by twenty men in the same time in the usual way. This is certainly a prodigious saving both of time and money, and having been found to answer the purpose so extremely well, renders it an implement worthy of attention.

After using this harrow, the heavy roller shown in Plate XLII. fig. 2, as before recommended, would have a very good effect, or there might be a roller of a lighter construction fastened behind the harrow, to roll at the same time; although the heavy roller would certainly make the best work.

Other implements, nearly on the same principle, have been constructed, particularly one of which I was shown a model by a gentleman near Chester. Its shape is in the form of an isosceles triangle, which is laid upon the road, and drawn by shafts at the base. The two sides by meeting in an angle opposite the base, are supposed to draw the loose materials towards the middle of the road. It has two small wheels near the base or front, and one at the angle in the rear, with different contrivances for fixing the whole frame higher or lower as required; but as I did not learn that this machine had been successfully tried, and as it appeared to me rather more complicated than the one already described, I conceive it unnecessary to give a drawing of it.

The Bishop of Landaff was so very obliging as to show me the model of a very plain and simple instrument used in America for levelling the surface of grounds. An instrument of the same kind, or on the same principle, might probably be successfully used in repairing or forming roads. It consists of a strong plank A, Plate XLIV. fig. 2, about five or six feet long, and shod with iron at the lower part, which has a sharp edge, in order to scrape the surface of the ground as it is dragged upon it. At the back of this board is fixed a frame, as represented in the figure, on which the driver stands and directs the horse that draws it, by two rings or hooks B B. Nothing can be more simple than this implement, and for smoothing or levelling a loose surface nothing, I should conceive, could be more speedy and effectual. The weight of the driver standing on the frame behind, keeps the whole steady when at work, and should it be obstructed by a large stone, or any other impediment, he

can easily step off. It occurred to me that the driver might sometimes be thrown off in such cases; I thereby took the liberty of suggesting, whether if the machine were made considerably heavier than a plank, in front, and to have a pair of handles behind to direct it by, it might not be an improvement, and prevent any danger to the driver: but the Bishop, in his very pleasant and good humoured way, said it was so perfectly complete already, and found to answer the design of it so very well, that it would admit of no sort of improvement whatever, nor could he allow any alteration even to be proposed upon it.

A machine for the more easily breaking stones to repair roads in the common way would be of very great use. At present this is a tedious and laborious task. I think that labour might be very much abridged, but as I have not yet completed my plan for that purpose, I shall delay at present giving any particular description of it.

Although several contrivances have at different times been proposed for facilitating the repair of roads, and lessening the expence, yet that expence is no doubt very great, especially in those places where many heavy loaded carriages are continually passing. The ruts made by the wheels soon become so deep, and the materials of the road are thereby so much tore up, that it is almost an impossibility, however hard the materials, to keep the road for any considerable time in proper condition.

The contrivances already mentioned, as well as several others of the same kind, have all tended to point out methods of replacing those materials, and filling up the ruts, taking it for granted, that however solid the road may have been at first, such ruts must unavoidably be made in it; but in my humble apprehension the common observation, that "it is easier to prevent an evil than to cure one afterwards," may justly be applied in this case; for it appears to me that a method may be devised which will in a great measure prevent ruts being made in roads, at least never above two or three inches deep, even though the road is pretty soft, provided the middle is sound.

The importance of such a contrivance, if effectually put in execution, would be very great, the saving of expence not only in the repairs, but in the original construction of roads, would be prodigious, and the advantages arising to society in general, by rendering the intercourse more easy and pleasant, and far less expensive, are hardly to be conceived.

In order, therefore, to find a remedy for this evil, we must first consider the cause. This is evidently owing to the wheels of heavy loaded carriages cutting through

even the hardest materials, and sinking into the road, consequently if this can be prevented, we of course remedy the evil complained of. To accomplish this important point, and to prevent the wheels of carts or other wheel-carriages from sinking into the roads, are certainly objects deserving particular attention.

Broad wheels have long been in use, but although they are no doubt a great safeguard to the roads when properly constructed, yet while they are allowed to be shod in the manner that some waggon wheels are, with so many separate rings detached from each other, and the heads of the large nails projecting so far beyond them, it is impossible for even a road of adamant to withstand the crush of such destructive engines, especially when loaded with so enormous a weight as is sometimes contained in an English waggon. Besides, as those broad wheels are very expensive, and therefore cannot become general for agricultural purposes, it would be of the greatest consequence to the community at large if some other method of protecting the roads were pointed out, that could be more easily attained, and of more general utility. The following method is therefore with deference submitted to the honourable Board of Agriculture, and to the public, as being easily attained, and applicable to any wheel-carriage, without altering their present wheels.

Suppose Plate XLIV. fig. 3, to represent the hind view of a cart or waggon. The wheels A and B when heavily loaded, aided by a succession of carriages following the same track, will make the ruts complained of, while the horse-path in the middle often remains entire; and yet this frequently gives way too, at the places where the wheels sink in, owing to the additional force it requires to draw them out again, and not perhaps to the road being softer there, than in any other place; consequently wherever any obstacle comes in the way to impede the draught, or to require a greater exertion to draw it forward, the road will in that place the sooner give way. This is the case also where there are deep ruts, which often require a greater force to get through them, than even to surmount the most hilly roads.

To prevent wheels forming these ruts, or sinking into those already made, suppose a small broad wheel or roller placed between the other wheels, as at E,* being fixed directly under the axletree, to which it is so strongly secured as to be able to support the whole weight in the cart when necessary, which it will always do when the other wheels come to any deep ruts formed by other carts. The lower part of the circumference of this roller (which I think may with propriety be called a pro-

* See Practical Treatise on Rural Improvements.

tector) should be about an inch and a half or two inches above the level of the line CD, drawn from the lower part of the wheels, and the upper part about the same distance from the main axletree, from which there must be a scraper, to keep it always clean. The size of the wheels will accordingly regulate the size of the protector; but in general about twenty-two inches or two feet in diameter, and eighteen inches broad, will do for single carts. For double carts or waggons it may be larger and broader.

By keeping the protector a little higher than the lower level of the wheels, it is evident that on good hard roads or streets the wheels will always bear the principal part of the weight, nor can they make ruts in any roads above two or three inches deep, nor sink into other ruts, however deep they may be, while the middle of the road remains firm; for the protector will roll upon the middle, which will certainly be a much easier draught than if the wheels were in the ruts.

For large carts or waggons there might even be more than one of these between each pair of wheels, which would be all the better for the roads; but might be thought to increase the weight of the carriages too much, and therefore one of them, as shown in the figure, will in general be sufficient. It may by some be objected, that even one will give too much additional weight; but this can by no means be the case, for if properly made, the weight will be inconsiderable, when compared to the utility in saving the roads, and lessening the expence of making them; besides, the wheels and other parts of the carriage may be made a great deal lighter, as they will never jolt so violently from side to side in bad roads, which is not only a great strain upon every part of it, but upon the horses also.

It is almost impossible to keep roads in repair, while such heavy loaded carts, as at present used, and in many places with narrow wheels, are allowed to travel upon them. Even the broader wheels are but little better in the manner they are commonly shod, but if the method here recommended were applied, such wheels could neither make ruts, nor sink into those already made, and the roads would not only be much easier kept in repair, but would be much less expensive to make at first, as there would be little or no occasion for so great a quantity of hard materials, nor for a foundation of such stones as commonly laid.

In Lancashire and Cheshire where many of the roads are paved, and where the expence of making a new road sometimes amounts to the enormous sum of two thousand pounds per mile, and generally to a guinea per yard in length, the saving would be very great.

It is therefore hoped that so simple a contrivance, producing in all probability so many good effects, will at least have a fair and impartial trial, and if found by experience really to possess all those advantages here pointed out, no heavy cart or waggon, with wheels of the usual construction, should ever in future be suffered to go upon any turnpike road without a protector. There should even be a considerable abatement in the charge made at turnpike gates, in order to encourage the use of so beneficial an improvement for the preservation of roads, and which may besides be the means of saving some expence in the construction of carts and waggons, by admitting of their being made considerably lighter.

It is unnecessary to enter into a description of the different kinds of materials used for repairing or making roads, or to point out the best, as the choice of these must depend chiefly on the nature of those most easily to be found in the neighbourhood. However, by the principles already laid down, it would appear that a *stratum* of any porous substance, such as sand, or sandy gravel, or the refuse of a freestone quarry, is the best foundation for a road. On this should be laid the harder materials, such as stones broke very small, or gravel; the best sort of stones being those that are hardest or most brittle. It must, however, be observed that limestones, or any other calcareous substance, ought never to be used on a road where other stones can be had, for in a very short time they will moulder down, and be reduced into a sort of clay, that in wet weather will make the road extremely dirty, and retain water on the surface, than which nothing can be more injurious. If small stones are used for the finishing coat, they should be thinly covered over with fine gravel, or freestone sand, so that all the vacancies among them may be completely filled up;* by which means the road will not only last the longer, but it will be more agreeable to travel on, and will continue the longer in good repair.

SECTION IX.

New System of Road-making, and Conclusion.

There is yet another system of making roads, which in some particular situations might be adopted to great advantage, and might even in some measure answer nearly

* This is in some places called *blinding* the road.

nearly the purpose of canals, where water cannot easily be obtained. Being constructed entirely on the same principle, they might, without much impropriety, be called *dry canals*.

The method alluded to is to make such roads quite on a level, as canals are conducted, and where there is an unavoidable rise or fall, to have an inclined plane, upon which, by the aid of machinery, if necessary, waggons or heavy loaded carriages of any kind, may be raised or lowered.

Near Coalbrook Dale there is an inclined plane of this kind, a little way from the iron bridge over the Severn. Upon this plane loaded boats are drawn up to a canal 220 feet above the level of that river, and also let down the same way from the canal into the river. This one inclined plane therefore saves twenty-two locks of ten feet fall each, and it is really wonderful to see with what facility the operation is performed.

This, I suppose, is the greatest inclined plane in Europe, perhaps in the world, for although inclined planes are much used in China, instead of locks, yet I have never heard of any of them equal in height to that at Coalbrook Dale. But on a road, such as we are proposing, those on a very small scale, in comparison to that, might do. If for the purpose of raising a waggon only the height of thirty or forty feet, the expence would not be very great, nor need the machinery be very powerful. Perhaps in some places even a common capstan, or wheel and axle, might be sufficient.

Roads made upon this principle should be laid with cast-iron rails for the wheels of waggons to run upon, the expence of which would not be so great as may at first be imagined. There is a rail-road of this kind formed through a peat-moss near Manchester, the expence of which amounted only to about three hundred pounds per mile. On this road (made by the ingenious Mr. Wakefield, already mentioned) a single horse will draw with the greatest ease seven waggons at one time, each waggon loaded with about seven hundred weight of marl, being in all forty-nine hundred weight, and including the weight of the waggons, will be upwards of three tons, drawn by one horse over a moss, where, a few months before, even a dog could hardly venture without the risk of being *swamped*.

For a public road it would perhaps be necessary to make the rails somewhat stronger; but supposing the expence to be even five hundred pounds per mile, or more, it is trifling in comparison to the advantages to be derived from the prodigious loads that even a single horse or ox might draw on such a road, for oxen might in that case be employed even more profitably than horses.

If a farmer could send to market three or four tons weight of his crop by a single horse or a bullock, and could bring home the like weight of manure or coal, by the same means, what amazing advantages might he not reap, and how immense would be his savings, when compared to the expence of sending away or bringing home that quantity in the present way. If the rails were kept in proper order, and the wheels and other parts of the waggons properly constructed, I make no doubt a horse might draw in this manner a much greater weight than four tons, for it appeared perfectly easy for the single horse to draw the loaded waggons above-mentioned.

At some of the inclined planes upon such a road, the waggons might be drawn up even without machinery, for if a horse is drawing six or seven such waggons upon a level, and comes to the bottom of an inclined plane, the waggons might there be unhooked, and drawn up one by one to the level above. Or if horses for the purpose were kept near those inclined planes, they might assist, and perhaps bring up two, three, or more waggons at once, and return for the rest; or if some waggons were coming down, while others were going up, they might assist each other.

Instead of inclined planes it might at some places be thought better to make the rise perpendicular; in which case the waggons might be lifted up or lowered down, one by one, by a crane or other engine. But as it would exceed the bounds intended for these general observations, to enter here into a more minute account of the mechanism of such a road, and as the whole manner of constructing rail-roads, with their different turnings and passes, as also the inclined planes, the waggons and machinery, together with some remarks on waggon roads in general, are all fully explained in another work, we shall therefore refer to that for a more minute detail of these particulars.

CONCLUSION.

If any of the foregoing hints can contribute towards improving the internal communications through the country, it would afford me the most sincere satisfaction. Several of the plans and principles recommended are, I believe, perfectly new; I am therefore aware they will at first have a great many prejudices to overcome before they will be much attended to by some people; but to those of a liberal and enlightened understanding, who are not apt to be led away by prejudice, I hope they will

at least furnish some materials for reflection or experiment; and as they may no doubt be greatly improved upon, I shall be proud if they have even the effect of attracting the attention of men of genius and a liberal way of thinking, who are certainly the most capable of improving on such hints. But to attempt conquering the prejudices of some country people, is a task so difficult, even in the alteration of a cart wheel, that it is hardly to be expected, at least for a considerable time. As a proof of this, I shall take the liberty to mention the following instance, communicated to me by a very respectable gentleman in Cumberland. In that county it is a common practice to use carts with clog-wheels fixed to the axle, which turns round with the wheels; every person who understands any thing of mechanics, must know that such wheels are not so easily drawn as spoke-wheels, moving round a proper fixed iron axle. That gentleman wished to introduce the spoke-wheel and axle of that construction, and was even at the expence of making a present to a farmer of an handsome light cart with such wheels. The farmer tried it, but being so obstinately prejudiced in favour of the clog-wheels, he conceived the spoke-wheels to be so much heavier a draught for his horses, that he absolutely returned the cart in a short time, saying that he was so convinced the clog-wheels were easier drawn, and in every respect so much preferable, that the cart was of no manner of use to him whatever.

In some parts of Yorkshire, waggons are used in preference to single carts, because the roads are hilly; and it is somewhat curious that in other parts of the same county, single carts are used in preference to waggons, for precisely the same reason.

In Lancashire, Cheshire, Shropshire, and other parts, they use carts and waggons of such a prodigious size and weight, that even when empty they are a most toilsome load for horses to draw. But, although there is no part of the kingdom abounds more with men of real genius and enterprize, yet to attempt persuading some of the country people in these counties that the weight of the cart or waggon itself can occasion any additional draught to the horses, would be as difficult a task as to convince them that it is possible to preserve corn in the straw without housing it in a barn, or that a farmer can carry on business without a huge red or blue waggon, that requires six or eight horses to move it. It must however be evident, that the lighter the cart the easier the draught, consequently the more will the horses be able to draw of whatever it is loaded with.

What is the reason of the roads in Lancashire and Cheshire being so very expensive, but the prodigious weight of these unwieldy carriages. If they were

abolished or improved, the roads there would be no more expensive than in other places.

In Westmorland, where light single carts are used, the roads are in general good, although hilly, but there can be no doubt of the advantages that would result every where by using single-horse carts, instead of those enormous waggons just alluded to. However the most material advantage of all, is the preservation of the roads. This I conceive might also be in a great measure effected by using the protector already recommended, even if applied to heavy carts; and perhaps it might be a more easy matter to persuade those who are so much prejudiced in favour of large carts, to adopt this simple improvement, than to lay aside entirely those carts they have been so long accustomed to.

The expence of making and supporting roads, is so heavy a tax upon property, and also upon individuals, that it is the interest, as well as the duty, of all persons having the management or direction of roads, to give every possible encouragement to any plan that may tend to alleviate so heavy a burden. It is presumed, that by adopting the methods herein pointed out, it would then be a much easier and less expensive matter to find materials for making roads; and particularly those made according to the new theory, would, in the event of adopting the simple improvement recommended on wheel-carriages, be as pleasant to travel on as any gravel walks. A great deal, if not all of those expensive materials, broken stones, might then be saved, and the roads would be so smooth, that instead of horses oxen might be employed in wheel-carriages, without being shod; which, on account of the difficulty of that operation, and the tenderness of their feet, are at present seldom employed in that way, and the advantages of employing oxen instead of horses in all the operations of husbandry, as well as in carts and waggons, are so many, that every encouragement should be given towards making general so very beneficial a practice.

The rail-roads, or *dry canals*, might also be of infinite advantage in some situations, not only by enabling great loads to be transported at a small expence, but by saving other roads, or other parts of the same road, from the pressure of heavy carriages, which should only go upon the rails, consequently the other parts would last much longer, and require but few materials to make them at first. Such roads would also completely remove the objection made by some people to canals, that they render a country unhealthy by the great quantity of stagnant water they contain. Whether this objection is well founded or not, I shall not pretend to determine; but I am

inclined rather to believe that it is altogether groundless. It is, however, an object of some importance to the community to have it ascertained. At the same time, unless it is very clearly proved to be detrimental, no ideal conjectures whatever should be suffered to check so truly important an improvement as the making of navigable canals, wherever they can be executed to advantage.

The principle of making one horse draw several waggons at the same time, might also be advantageously applied on other roads, if smooth and in good order, and the waggons of a proper construction, for it is evidently much better for the roads, as well as easier for the horse to draw (as before stated) seven light waggons, containing each seven hundred weight, than to draw one large waggon containing forty-nine hundred weight. In the former case the pressure upon each wheel on even ground is only equal to one hundred weight and three quarters. In the latter it is equal to twelve hundred weight and one quarter, besides the difference of the weight of the waggons. In other words, the pressure upon the road is seven times greater in the latter than in the former case, which must make a very material difference in the tear and wear of the road.

If dividing the load in this manner, by making a horse or a team draw several light waggons at once, should ever be put in general practice (which it might easily be if the roads were kept in very good order) when they came to the bottom of an ascent, on which they could not draw up the whole together, one, two, three, or more of them might be unhooked, and returned for, when the others are got up, as on the inclined planes already mentioned, and these might be again hooked when they reach the top, and then proceed on their journey.

Bridges and aqueducts, although nearly connected with those subjects, and a more minute description of the manner of constructing navigable canals, are here purposely omitted, not only as being subjects of a very different nature from what we have been treating on, but as leading into a practical investigation, which would far exceed the bounds intended for these remarks; but as they are all minutely discussed in the work already referred to, we shall therefore again refer to that work for a more particular account of them.

The subject of repairing roads, and keeping them in proper order, is of considerable importance, and might have been more enlarged upon, and other methods for so doing pointed out, besides those here stated. Some other contrivances might also have been mentioned for preventing heavy wheel-carriages from doing so much

injury, particularly a plan for making them immediately replace any materials that might be displaced by the wheels, and fill up as they went along any ruts they may make. But as I have perhaps already, with too much freedom, advanced doctrines that have not yet been sufficiently proved, and proposed plans that may meet with considerable opposition, I shall therefore, for the present, refrain from advancing any thing further, and rely on the candour and liberality of those who may peruse these observations, in hopes they will do me the justice to believe, that my only motive for having stated my opinions with so much freedom, is a sincere desire to suggest or to introduce any thing, however theoretical it may appear, that may tend to promote the public good.

I shall now finally conclude with remarking, that whatever plans may be adopted for the improvement and better management of the highways, two essential preliminary points are absolutely requisite; namely, an improvement in the construction of wheel-carriages, and a total alteration in the mode of choosing surveyors, without both of which, and the most scrupulous attention to the qualifications of the latter, it is in vain to think of amending the present system of road-making, or of lessening so much as could be wished, that heavy burden on landed property, on agriculture, and on the community in general.

XIII. *Observations on the Public Roads of the Kingdom, and the Means of Improving them. By Mr.* John Wright *of Chelsea.*

INTRODUCTION.

All my knowledge of turnpike roads, their formation and repairs, their income and expenditure, the abuses which have crept into the management of them, and the means by which these abuses may be remedied, is derived from experience: and what is now respectfully submitted to the cognizance of the Board of Agriculture, consists not in the reveries of untried theory, but details the practice of many years, and observations actually made on the spot, and in the business to which they relate.

But so much of these matters, in all their forms and agencies, from the labourer to the trustee, has been transacted under my inspection, that in this stage of the inquiry at least, I do not think myself perfectly at liberty to say all I know.

He who desires only to speak truth, may say much in few words, and ought to be liberally construed, where he wishes to express himself with delicacy. But I have no hesitation in saying, that the whole system, as now conducted, either through inability or neglect, will not, on a fair and impartial investigation, be found altogether satisfactory.

And it becomes me here, once for all, to express my extreme regret, that so important an object should have been so long abandoned to incapacity or want of system. For on the maturest consideration, such is my opinion of our tolls, and the repairs of our turnpike roads, that the former may be rendered infinitely more productive, and the latter effectually rescued from the mangled state in which they are at this time, with much less expence than they now cost.

Trusts regulated.—Turnpikes have often been under the cognizance of the legislature, and are the specific object of many acts of parliament. These have been sometimes amended from the First of George the Second, to accommodate them to the exigence of the case; but from the sixth of the present reign they have undergone little alteration.

The general system is good, but still susceptible of much improvement, from the various and successive changes which the progress of agriculture, trade, and manu-

factures, the increase of property, industry, and arts, unavoidably occasion in the face of the country.

The roads originally under the care of trustees were then well framed, and made so commodious for travellers, that nothing was left to be done but common repairs. It was at that time customary for gentlemen of property and respectability to give their attendance, and be acting trustees, to see how the money borrowed, and the income of their tolls were applied, and take care that every one employed in the concern should do their duty.

For the first twenty years this regularity was tolerably kept up, and some trusts were so well managed, as to liquidate part of their debt.

Since that period, the case has certainly altered very much to the worse. Many noble and respectable gentlemen are still named, but they rarely act, or take any share in the business. Their personal attendance is seldom given, and their interference with those, on whom the whole concern habitually devolves, might not be desireable.

It has often struck me, from the numberless inconveniences of the present inefficient mode, that perhaps there might be an improvement in electing trustees, as well as in their number and description.

Little or no regard has of late been paid to these points, essential as they undoubtedly are, to every thing like order or economy. Might not candidates for the trust be required to qualify, in the same manner as is customary for commissioners of the land-tax? Indeed, now that the roads are established, and want nothing but common repairs, it must appear that trustees are too numerous, and that if fewer were appointed for each trust, the business would be better attended to.

Means of Superintendence.—The trusts which have the direction of tolls and roads on the present establishment, constitute a numerous body, which have long acted without a head. And my opinion is, that some means of superintendence, either by a committee of the House of Commons, annually appointed, or an office in London, (perhaps the Board of Agriculture might undertake it,) to receive and audit the accounts of trustees, is absolutely necessary for adjusting the whole of this complex business, and bringing it into some regular shape and system.

A Committee of the House, or such a public office or institution, should have ample powers of authority over every trust in the kingdom, and all of them should be made equally responsible to it.

It could not injure the interest of any one individual, and must command the

approbation of at least two-thirds even of the trustees themselves. Its advantages, from the combined judgment and experience of so many individuals, are not to be calculated.

It would be a check or control on every trust; detect, by comparing one with another, every bias to improper direction, bring into one view the immense sums raised by the whole system of tolls throughout the kingdom; specify the sum total of the entire expenditure, and shew the extensive line of roads which every where traverse the country.

Nor should the proposed institution be viewed with jealousy, as a suspicious check on trustees. It is actually intended to conciliate and unite them, and might afford the whole an opportunity of seeing the real state of every separate trust; for each of them would thus be enabled to comprehend the principal proceedings and machinery of the whole.

Though now divided into nearly seven hundred different and independent bodies, all of them strangers to the transactions and distinct views of each other, these trusts might in this manner be brought together, and made to co-operate as one great efficient body for the good of the country.

Were the real state of every trust thus generally known, parliament would be in a capacity to judge of the specific indulgence requested in their respective applications. But these are now so commonly brought forward in the shape of private bills, and left to the decision of committees, not unfrequently (however innocently, perhaps insensibly), biassed by the personal weight or address of interested parties, that the House at large, and even the neighbourhood to which the act relates, are often perfect strangers to what is really enacted by the bill.

This further convenience and advantage, would also accrue from such an institution, that it might both accelerate the business, and lessen the expence of renewing the different acts as they expired. Indeed, one annual bill might be sufficient for the whole. At present, the road acts are commonly renewed every twenty years, which in that period is attended with an expence of £ 200,000; or at the rate of £ 10,000 per annum, the greater part of which might be saved.

The renewing of the acts is a transaction which lies wholly in the department of the clerk to the trust, who, for the most part, is also treasurer, and an attorney. And it is natural to suppose, that he will make the utmost he can of such a circumstance.

It seldom happens that the same person renews a second act. He is, therefore,

a stranger, at least in some respects, to the business, and being probably detained in town for three or four months, occasions a great deal of expence to the trust. Being in no degree responsible, it is also possible for him to be tampered with by such as wish the act fashioned to answer some other purpose than merely that of the public.

However immaculate in this respect, it frequently occurs, that through some mistake or other he is obliged to make a second journey, perhaps from the remotest part of the country. The expence of this must be considerable, and falls entirely on the trust, which is generally in the habit of passing the account implicitly.

But might not all these be occasionally renewed, as they are wanted, by one person in town, appointed by the office above suggested, and cognizable by it for that purpose, at less than one half of what it now costs.

Should an office be established for answering these ends, various other improvements have occurred to me, which might then be suggested with propriety.

Revenues, Debts, Bonds.—Considering the vast increase of the tolls for twenty-five years past, and the very disproportionate extra expence of repairing the roads, the debt in which most of them are still deeply involved, must appear to all unacquainted with their management perfectly unaccountable.

Notwithstanding all the monies they receive, they are always in want. When an expenditure thus inordinate becomes the subject of public discussion, time perhaps may reveal what that enormous gulf is, which so incessantly devours all their supplies. Indeed few can be at any loss to guess, who consider the abilities of those who, without any control, have the disposal of all the prodigious revenue annually produced by our tolls.

Were it once generally understood, that the Board of Agriculture wished for any information upon the subject, it would receive such abundant statements from all parts of the kingdom, as must soon satisfy it regarding every necessary object of inquiry.*

The bonds due on the different roads, now depreciated by a discount of from ten to thirty per cent. properly regulated would assuredly rise in value to such a degree as perhaps to bear a premium. And surely these debts ought to be no secret, as the public has a right to know the utmost extent of its burdens.

No funds of any description are either better secured or worse conducted, than what our tolls produce at present.

* Any information on so important a subject as that of roads, must certainly be acceptable to the Board of Agriculture.

Trustees of turnpike roads might actually be the richest body in the kingdom. Their revenue is nearly about six hundred thousand pounds, paid in quarterly, and attended with no expence. The whole lies within a narrow compass, and only requires to be disposed of with that prudence and economy which it has so little experienced for some years past.

The establishment of a board or office of superintendence, as above suggested, will have the state of every trust always in their eye, should be the common bank of all, and empowered to pay off whatever bonds seem most urgent.

When this subject is brought fairly before the public, it will be evident that the advantages arising from the system of reform for which we contend, is not confined to the repairs, but extends to the whole management of our tolls in all its departments, and that the tolls have increased nearly one-third in the last twenty-five years, and are still increasing with every lease as it expires.

All the supplies for this undertaking are implicitly granted and raised. But the necessary inquiry is, how is it laid out, or how may it be improved with most advantage *to the public?* Ought not a matter of such extent, such importance, and such incalculable resources, to be put in the best train, and regulated with as much care and accuracy as other public undertakings are.

So deeply is my mind impressed with the prodigious increase of this much neglected fund, that from long experience and close observation, I have not a doubt but whoever is alive on the spot, and conversant with the business twenty years hence, will not be surprised to find it realize a sum little short of half a million sterling.

Repairs of Roads about London.—These roads are now repaired under the direction of surveyors, chosen and appointed by the trustees, who seldom pay competent attention to such qualifications as are requisite for that undertaking.

Most surveyors, therefore, know no more of the business consigned to their management, than the labourer who works under them; but enter on the task merely as apprentices, and by a little attention, may pick up a smattering of information by chance or experience; but all work must suffer in the hands of such imperfect workmen.

Nor is judgment in the object of appointment, the only or chief requisite in surveyors. From the accidental attendance of trustees, who generally meet but a few hours in twelve months; the remainder of the year, and all its calls and occurrences, are also left, for the most part, to their management.

Roads are made, repaired, and improved by ballast, cartage, and labour; and these are under the sole direction of that numerous body.

Lighting and watching is usually performed by contract, for a certain stipulated sum.

But, in the proper use of these three things, consists the greatest part of the improvement and reform that appears indispensably necessary in an efficient repair of the roads.

It is not an easy matter to know when the surveyors *in the vicinity of the metropolis* begin their operations. For the most part it takes place in May or June. They cover their roads with ballast from four to fourteen inches thick. They fill up no holes or ruts before this stuff is laid on, and of course it is actually reduced to sand or jelly, by the perpetual motion of all the different kinds of wheeled machines, not unfrequently even before the winter sets in.

The roads are then one continued slough, or have the appearance of a canal of loose dirt, rather than of an highway in good order.

All this ballast thus pulverized, must in its turn be taken off, at the same expence it was laid on. By that time the holes and chasms every where open larger than before they were covered. This occasions a perpetual repair to be carried on the whole year; and no materials, huddled together in such quantities on a hard bottom at unseasonable times, will bind or adhere into such a solid mass as is required on a turnpike road.

It may be considered as a positive proof of this fact, that the road from Hyde-park Corner to Kensington is not three inches higher than it was thirty years ago, though it has consumed as much ballast as might have paved it with dollars.

What then may be said of all the roads ten miles round the metropolis, not passable in summer for clouds of dust and heaps of ballast, or in winter for mud and holes?

One grand line of roads extends about thirteen miles from the metropolis, which contains two trusts.

The increase of their tolls has amounted in the last twenty-five years to three thousand pounds. But even this vast advance has not enabled them to pay off any part of their debt.

Their roads are still in that dilapidated state in which they ever have been, except when the season of the year and a tract of fine weather make them commodious and good.

Were these roads put on the plan of repair here proposed, they would levy a clear annual sum of fifteen hundred pounds, paying interest, and every extra expence incurred by their respective trusts.

And may it not also be reasonably presumed, that every individual trust throughout the country, in proportion to the receipt of their respective tolls, would levy nearly an equal sum?

Country Roads.—Our country roads have the advantage in may respects over those near town, especially in situation and access to materials. There, labour is the principal source of expence: the roads are in general open, wide, well formed, and easily kept dry.

This, however, is commonly neglected, by not making the ditches, water-courses, or drains, sufficiently deep and wide on each side, and accommodating them to occasional declivities with sufficient care.*

These ditches or sewers would abundantly pay for constructing, by serving as a kind of repository for water and manure, and properly managed might form a great acquisition to farmers.

In most counties the roads are repaired with stones and flinty chalk, which, fitly applied, are the best materials in the world.

Holes and ruts, caused every where by narrow-wheeled waggons, are commonly filled up with stones of a large size, which are afterwards covered with a small gravel from the bottom of quarries. This gives the appearance of a smooth road, but is soon reduced to dirt or dust, and then it becomes rocky and rough, as travellers in most parts of the country have experienced, as well as their carriages.

Were these stones broken about two inches square, and the holes and ruts every

* If this was observed, and the roads kept on a proper convex, no water would lie, which is the destruction of them all. Where the turnpike is narrow the ditch should be kept deep and clean, the water would then soon waste, and the road would be firm and dry; the hedges should be cut very low, to let the sun and air have power, which make the best roads. In many parts of the country, where the roads are wide, there are large quantities of ground on the sides; ditches there are not so necessary. But there should be drains on each side, at the distance of one hundred yards apart, that will keep them dry and clean, and prevent ruts in future, and be a great saving in materials and labour. The high road should be occasionally attended by one man, according to the tear and wear, to fill up the ruts and holes as they appear, especially after materials are laid on; and to prevent heaps of gravel and dirt being laid on the sides of the road.

where made good, one covering might serve a country road two or three years, with a very small addition occasionally applied where most wanted.

One load of stones prepared in this manner is fairly worth three loads of gravel from a common or a river. The texture is so much better, the bottom firmer, and the surface more equal and uniform.

In many places few stone quarries are to be found; but ploughed fields abound in all parts, in which loose stones are generally more or less in plenty. These both landholder and tenant would, for the most part, be very glad to have gathered, as it might prove serviceable, especially to lands intended to be laid down.*

If the power which trustees have on some lands to avail themselves of this circumstance, at certain seasons with discretion, on all, were made general, it would be a convenient resource for improving the roads in most situations too distant from other materials.

Repairs proper.—Keeping our roads in good order, is a very obvious and simple matter, and only requires a little attention, and an ordinary measure of common sense.

But the state of the business in this, as in many other cases, may perhaps account for the neglect with which it is so commonly treated.

The moment surveyors are chosen, they become men of too great consequence to take any advice. The power they acquire is too extensive for their abilities, and they know not how to use it, either with advantage to the public, or credit to their employers.

The object of all repairs on great thoroughfares, or the most public of our leading highways, is to provide against winter. The sun and season which make the best roads, make them even pleasant for summer; but to render them passable in winter, requires a combination of considerable care and labour.

There are four months in the year when the highways should be mended.

They should have a moderate covering in March and April, where it is wanted, a very good one of ballast in September and October.

Let the road be first cleaned, and its holes and swamps filled up in the following manner:

" The ground loosened thoroughly at the bottom, and the vacancies then supplied,

* This is not always the case; gathering stones near Stevenage, reduced land from 20s. an acre to nearly 10s.

" and rammed down, until even with the crown of the road, in the same manner as a " pavier does his pavement."

Places which undergo a reform of this sort, remain ever after the firmest part of the road. *

It is not the quantity of materials which make good roads; but roads carefully put and preserved in a state fit for profiting by a proper disposition of them, seasonably laid on and carefully tended.†

There should be three or four labourers appointed to attend the high or leading roads, according to their wear or length, especially in the winter season. These men would keep the ballast in its proper station, the crown of the road in its due form, *a regular convex*, the channels clean and the drains open. By this means, no water or loose dirt could lie on the roads, even in winter; holes, ruts, and swamps, of all kinds would be prevented for the future, and carriages run with ease on the nail, the whole year. These strictly observed, would be a saving of materials and labour, which is daily expended in waste.

By adopting these obvious measures, what a number of disagreeable accidents might be avoided, to which travelling is now so obnoxious, from the present broken and rugged state of turnpike roads.

There is hardly a week in the winter season but we hear of carriages overturned, limbs broken, and lives lost; more, perhaps, by the badness of the roads, than even the carelessness of drivers.

* Trustees, as well as their surveyors, in the neighbourhood of London, are very particular in the size of their ballast, and desirous of having it large. I am of opinion, however, that the small ballast and particularly that of a moderate size, if well cleaned and clear of sand, will adhere and bind on an old beaten road much sooner than large.

† It must be observed, that water is of service to all roads, but must not be suffered to lie. If they are kept in a regular convex form, and a sufficient quantity of drains to receive the torrent of rains in the winter; they would wash and keep them commodious and clean. The new roads on the Surrey side of Westminster bridge, though open, airy, and wide, well formed, and lying high above the level of the ground, afforded a good opportunity for drains, yet there is not one at half a mile apart. This is a defect through the whole kingdom. The consequence is, that the rains in winter fill the roads with loose dirt, which is raked off to the sides, and lies there three or four months as a nuisance, and takes up one half of the road. If there had been a sufficient number of drains made to carry off the water, the roads would have been clean all the winter, and nothing but a little dry dirt to be taken off. Little as this may be thought of, the want of this circumstance is the principal cause of all our bad roads, whether statute or turnpike.

How can it be otherwise?—in many places abandoned for most part of winter to chance, where, by sloughs and gulfs in one part, ruts in another, and ballast left here and there like heaps of dung on a field, no tract is preserved in which carriages of any sort can live, but what is made at the most imminent hazard, by forcing a passage through all these protuberances and impediments.

A considerable line of roads might be thus kept in repair from April to October, with a small quantity of materials. And two men constantly employed on such a station as this, would be of more service to the roads than any six as they now work in numbers.

The bye roads, originally made for local accommodation, which every where branch out from, and participate in the miserable condition in which the main roads are kept, require also to be more closely looked after. The whole country might, therefore, be highly benefited by adopting the system of repairs here recommended. Since what must mend the great roads so much, would naturally and speedily be practised for improving the less.

Broad Wheels.—A great alteration for the better might certainly be made in narrow-wheeled carts and waggons, drawn by two or more horses at length.

It would save, at least, one-third of the expence continually occasioned by repairs in statute as well as in turnpike roads, and might be generally adopted without any possible disadvantage to owners.

The benefit this improvement must inevitably ensure is hardly to be conceived, except by such as have often and long observed the daily mischiefs which the roads every where suffer from narrow wheels under enormous loads. The most durable materials, managed with the best skill, are but a slender preservative, and will last but a short space of time, under a wear and tear so absolutely irresistible.

Weighing machines have long been a nuisance on the roads, and ought to be abolished. They are erected at an immense expence, and then farmed out.

May it not be supposed the carrier and the lessee soon understand one another, and, that as the former is only accountable to the latter, he may load as heavily as he pleases.

All that these machines can possibly fetch is but a sorry compensation for the habitual depredation, such a collusion as this must occasion!

Broad-wheeled waggons alone have rolled, and made our roads as firm and good, at least, as we now find them. And every indulgence due to travellers, is doubly due to them.

Broad wheels are the only instrument, or external force, which can possibly bind and consolidate the materials of which our best roads are composed.

These, once made general, and all others proscribed, would keep the roads in perpetual repair, exceedingly relieve draft horses, perhaps lessen their number, enable waggoners to increase their loads, reduce the rates of land-carriage, render travelling more agreeable, contribute to the safety of our stages and mails, and, by preserving the levellings and tightness of our common highways, considerably facilitate the general intercourse of the country.*

I shall now conclude with the following proposition for improving, and more regularly repairing, the turnpike roads of the kingdom.

This matter is so seldom considered, and so superficially known, that there may not, at first sight, appear sufficient grounds for rendering it an object of much public advantage.

Whoever will take the trouble of deliberating on the following brief hints, may notwithstanding be inclined to think the subject susceptible of extensive improvement.

The writer of this, after long acquaintance with the business, in all its parts, and giving it the closest attention in his power, is perfectly satisfied in his own mind, that a plan may be formed capable of keeping all our public roads in full as good repair as at present, and also of making very considerable saving.

The probability of such a saving, from the alterations that might be adopted, can hardly be doubted, when it is considered that no public undertaking in this country is so lightly inspected, so loosely looked after, or carried on with so little frugality, as that of turnpike roads.

Many are the facts which account for this universal negligence, and which will be brought forward in detail, whenever a proper investigation takes place.

The several individuals who have now the actual management of our roads, are too often brought from obscure situations, and placed here frequently enough, for no better reason, but that they are not qualified for any other post.

These are the men who realize, and have the whole disposal of all that immense sum of ready money, except the interest, which is raised by our tolls; and which they generally squander in a very unprofitable manner.

* This is Mr. Wright's opinion; there are many persons who think very differently, and are of opinion that single-horse carts are infinitely preferable.

Nor is this owing altogether to the neglect of trustees, who do meet for a few hours once a month, or once a quarter.

It is, however, certain, that the same attendance has not been given to the meetings as formerly, since the number present is seldom sufficient to sign or pass the surveyors' accounts.

What now, therefore, is the business of all, has but little attention from any, as in all such cases every one takes as light a share of the common burden as he can.

He would accordingly have the trustees, in a great measure, relieved from their present trouble, the roads rescued from the mismanagement they are now under, and the monies gathered by the tolls, from the country at large, better husbanded, or laid out to more advantage.

For these purposes he proposes to lease out the repairs of the roads in general, with such restrictions, and under such conditions as may be pointed out.

He does not mean they should be let by auction and the minute glass, as the mode now is, for that mode is liable to much abuse.*

Neither would he have the leases for so short a time as they are usually granted. He thinks six years not by any means too long a term, as it may induce contractors to undertake the business at a lower rate, and enable them to do it better, by allowing them time to provide themselves with materials, and, as in most other things, to improve by experience.†

He has been long convinced by many years sedulous attention to what is doing this way; and the observations which have suggested themselves to his mind, from transactions habitually in his eye, that contractors may repay our roads, and keep them in the best order for half the sum it now costs the trustees.

And this he is perfectly prepared to make good, whenever called upon by those in office or authority.

The roads to any place of general resort in the kingdom, want little more than common repair.

* To prevent a collusion which frequently takes place with the persons who intend to bid for any contract, proposals should be delivered in previous to the letting, that trustees might have time to inspect the abilities of those who intend to farm the same, as well as the securities.

† In this trustees could not suffer; they should have one month's salary in hand, and security for the performance. By pursuing this plan they will find themselves relieved of trouble and attendance.

Attendance is of as much advantage to most of them in their present condition, as materials, which, whenever laid on, are seldom looked after, or used till the roads become impassable.

In the vicinity of the metropolis, where roads are most in wear, and the largest sums raised by tolls, much complaint is made for scarcity of ballast.* But there is as much in the Thames alone, easy to be come at, and at a moderate price, as for ages to come might supply all our roads three miles on each side from Woolwich to Oxford. This would likewise be of the greatest benefit to the navigation, as the gravel lies every where under the sand banks and sides of the river. A measure so very advantageous, and obviously necessary, could not fail to meet from the city of London with the readiest acquiescence.

There ought also, as he conceives, to be a very different method adopted of superintending the roads, from what is now the practice.

Were the proposition here stated and recommended once adopted, and a competent surveyor appointed, he would be able to serve all the roads in a district or county. But no contractor could act under the direction of the present surveyors, who by their mismanagement are the occasion of all the debts now on the tolls, as it would call their past conduct in question; and they would endeavour, for their own sakes, to perplex and embarrass him so much, that he would find it almost impracticable to fulfil his engagement, either with credit to his employers, or satisfaction to himself.

There is at present a Sunday's toll in most of the highways in the vicinity of London; and he submits it to the consideration of competent judges, whether any solid or insuperable objection can lie against extending these additional tolls throughout the nation.

The damages every where done by narrow-wheeled carts or waggons, drawn by two or more horses, surpasses all calculation. These, in fact, are the destruction of all our roads. An alteration in these, from six to nine-inch wheels, would save a world of expence in repairing our roads, and, in particular, would render weighing engines of no use.

Whenever parliament shall think it expedient to call in the general account of all the various trusts, which has not been done since the roads were first framed, it will

* The bowels of the earth in the neighbourhood of London, being already so much exhausted of materials for repairing roads, renders the Thames a very important resource for that purpose.

be obvious, from the rapid increase of tolls for years past, that most of the debts they owe, might before this have been cleared.

He pretends not to lay down any specific plan, competent to effect such a reform as the case of the bond creditors may require.

But he knows for certain, they are to be relieved, and that their relief would essentially benefit the public. These bonds at present bear various interests, and are not saleable, but at a certain and considerable discount.

Might they not be consolidated, and formed into sums of fifty or an hundred pounds, rated at one uniform interest of four per cent. and made payable to bearer?

As no debts of any kind whatever can be better secured, and the interests of no monies more infallibly provided for, these bonds made negotiable, by this or any other plan, might prove a very acceptable accommodation to the community at large, as well as extremely advantageous and convenient for the bondholders themselves.

XIV. *Letter from* William Jessop, *Esq. to the President of the Board of Agriculture, on the Subject of Inland Navigations, and Public Roads.*

SIR,

IN considering the subjects on which you do me the honour of asking my opinion, I must admit in the first place that you have good ground for your observation, *that much disadvantage has attended the unsystematic projection of Canal Navigations, and local and confined schemes of Drainage.* There are many instances where partial projects, once sanctioned by parliament, have shut the door against more general and beneficial extensions.

In this country, the commerce and agriculture of which has derived such important benefit from the extensive means already effected, of giving facility to the conveyance of the various products of the island, from parts where they were useless, to others where they are valuable;* it is an inquiry highly interesting, whether it may not be an object deserving the attention of the legislature, to promote a more general extension of those benefits, by a general survey of the kingdom, with this object particularly in view.

* It is observed by another correspondent of the Board, on this subject, that were it possible to suppose that our commerce could have been extended to the degree that it now is, without any other inland means of conveying goods, than by carriages over roads, that the horses necessary for the draught would have nearly required the whole produce of the land for their support.

Fortunately inland navigation and canals were devised and constructed, and by the facility with which heavy goods are thus conveyed, the most important advantages are the result.

Water is brought to us without expence of carriage, and is one of the many blessings showered down upon us, the sources of which are inexhaustible. The parts of which, though yielding to the least power, yet are capable of supporting immense weight, but are not like the materials with which roads are constructed, liable to great wear; and a canal once made, is not liable to much repair.

About four acres of land are cut up for the length of one mile of canal; but this land so cut is not yet lost, but may become a pasture for fish, and equally valuable as in its former state; and one horse on a canal is capable of performing the work of fifty horses upon a road.

The length of canals in the kingdom, when the whole under prosecution at present are completed, will be about 1000 miles. The sea-line of England, Scotland, and Ireland, and the adjacent islands, is about three thousand eight hundred miles in length.

Should this inquiry terminate in the approbation of the measure, I would take the liberty of suggesting to you an idea, which if adopted would tend to throw much light on the object of inquiry, and might be a considerable improvement in the geography and hydrography of the island.

Imperfect as our present maps are, they give tolerable information of the relative situation of roads and rivers, and of the distance of places from each other; but they convey no adequate ideas of the respective heights or depressions of the surface.

Taking the mean between the high and low water of a neap-tide as the level of the sea; if level lines were traced round the island at equal heights above each other (for instance twenty feet), and those lines were surveyed and laid down on a map as zones, you might, by counting those lines, ascertain within a few feet the height of any given point above the level of the sea: at promontories on the sea-coast, where many of them would meet, their height would be shewn; in the vallies, where those lines would diverge from each other, you would ascertain the falls of the rivers within given distances; above the general surface of the country the lines would define the shape of the higher grounds, and mountains; where they would cross public roads stones might be fixed (which on local surveys might be referred to), ascertaining by figures thereon, the height of those points above the level of the sea, or above or below similar points in other situations; they might be of some use also on being referred to in meteorological observations.

In the surveying of those lines, they might, by intersection, mark the situation of towns, villages, and remarkable points, and thereby would much contribute to the obtaining a correct map of the country.

The conduct of this business might be intrusted to an able surveyor, who should have under his direction ten or twelve sets of surveyors and levellers; one surveyor and one leveller in each set, with three or four labourers as assistants; active young men, who might be fully competent to the execution of their part of the business, might be engaged at little expence; their observations would be compared and corrected by their principal; and by setting out together, they would correct and check each other, when in prominent parts of the country they would be near each other.

With such a map before you, you might in your study generally ascertain the practicability of making water communications from one part of the country to another; whether they might be conducted on one level, or what rise and fall must be encountered: from hence, assisted by a mineral survey, and by the various informa-

tion which will be obtained under the institution to which you have devoted so much attention, you might draw the outlines of a general system, which would stand upon record, to be referred to when any local project may be brought forward.

While the zones in the map of the island would be complete but on a small scale, the parts of those zones appropriate to the county maps or other subdivisions, would on a larger scale be more accurately defined.

In the year 1792 I had occasion to make some observations on the subject of collecting and preserving flood waters by means of reservoirs; and I understand those observations have been referred to in your Report from Staffordshire.

Where proper situations may be found on waste lands, the appropriation of such lands to this use will hardly be objected to;* but it might be a question, whether the loss of more valuable land would be compensated by the benefits which other land would derive from it by irrigation; I believe those conversant in this practice would resolve it in the affirmative: but in conversation with a gentleman eminently distinguished by his improvement of the breed of live-stock, he has denied the position, that land is lost by being covered with water; and he is of opinion, that an acre of water well managed in breeding or feeding of fish, would produce more food for the use of man, than an acre of the best land under the best management; in corroboration of this opinion, I have been informed that a farmer in the neighbourhood of Wolverhampton, from an acre and a half of water, has for several years successively sold his fish in the market of Wolverhampton for more than twelve pounds per annum.

It is certain that little or no systematic attention has been given to inland fisheries; it is at least a matter worthy of investigation, and deserving the attention of your Board.

It may be objected, that reservoirs from which the water will be drawn off in summer, will be ineligible for fish. But it is necessary to be understood, that those reservoirs will generally be made by a high embankment or head across a valley; that the earth for making such head will be dug out of the bottom of the valley, within the reservoir; that a reservoir from thirty to sixty acres will generally require a head from twenty to thirty feet in height; that when two-thirds of the depth is drawn off, there may remain from five to ten acres of water, which will contain but

* If such a survey as I have described were undertaken, the surveyors might take notice of proper places for making reservoirs.

a small quantity of water for irrigation, but be amply sufficient to maintain the fish for a month or two, until it may be replenished by autumnal rain.

While the water is gradually drawn off, the desiccated borders of the reservoir may be ploughed, and sown with some vegetable; which may serve as food for the fish in winter, or as a nidus for the ova of insects, on which the fish may feed.

It may next be a question worth consideration, how far navigable canals may serve in some cases in aid of irrigation, as principal conductors of the water from reservoirs.

Many miles of canals are cut on sloping grounds, and are well adapted to discharge water over lands which lie below their level; in wet seasons they have generally a superabundance of water, which might be conveniently spared, while reservoirs are collecting water for the summer; in dry seasons few have water to spare, and any interference with them might create jealousy and distrust. In canals which may be hereafter projected, and especially if subjected to systematic regulation, terms of compact may be easily adjusted between land owners and undertakers of canals, while bills are pending in parliament. With those already obtained, it may not be so easy to treat; but it is certainly practicable when water is discharged from a reservoir into a canal, to ascertain the quantity so discharged: it is also practicable to lay pipes through the banks of the canal, which shall discharge an equal quantity, and if the time of running out corresponds with the time of running in, no disadvantage can result to the navigation.

While canal navigations are avowedly safe, easy, and certain, except in times of frost, I cannot agree with those who maintain, that they are in all cases preferable to river navigations: there is no rule without exception; there are numberless instances where river navigations are preferable to canals; first, because they are generally effected at the least expence; and secondly, because when obstructions are removed or avoided, they are susceptible of more expedition; except in the few weeks in a year where they are annoyed by floods; for being less incumbered with bridges, and having generally a greater width, vessels are enabled to make use of sails; and at such times the labour of horses is saved. On the river Trent, which, compared with some others, is very imperfect, goods are conveyed seventy miles for 8 shillings per ton, including freight, tonnage, risk, and profit of the boat owners; there are but few canal navigations on which the expence of conveyance is not half as much more; and I consider the expence of conveyance as the chief criterion. In

point of expedition, vessels frequently make a voyage of seventy miles, and back again in a week, including the time of lading and unlading; this has been done by the same vessel for ten weeks successively; and would often be done if they were not obliged to wait for their lading.

While I have my pen in my hand, I cannot refrain from the mention of a subject which I apprehend will come within the purview of your Board.

Next to inland navigation, public roads, and the carriages used on them, are highly deserving of public attention. I do not know any thing in this country (where mechanism in general has been patronized, and brought nearer to perfection than in most others) that has been more neglected than the proper construction of wheel-carriages, and the formation of roads.

It has been generally acknowledged, that for carriages of burden, broad wheels, which will roll the roads, are the most eligible; and by the exemptions which have been granted to those who use broad wheels, the legislature has certainly looked forward to the benefits to be expected from the use of them; but never was a proposition more misunderstood, or an indulgence more abused. Of all the barbarous and abominable machines that have been contrived by ignorance, and maintained by vulgar prejudice, none have equalled the broad-wheeled carriages that are now in use; instead of rolling the roads, they grind them into mud and dust.

Wheels compelled to move forward in right lines cannot roll a road, unless they are cylindrical; this was never stipulated by the legislature; they only required that the wheels should tread flat on the road, a given number of inches in width.

The wheel-wright, to give more strength to the wheel, to make the axis as short as possible, and to give more room above for the body of the carriage, dished his wheels (to use their phrase), at the same time making the sole flat; but instead of the sole or rim being cylindrical, it was a portion of a cone, the property of which, if it were to roll, would be to revolve in a circle; in a circle it could not revolve, unless set at liberty from the carriage, and then the wheels would leave each other, take a short turn, and come back again. Thus forced against their inclination to move parallel to each other in right lines, with an immense weight on them, having a little liberty on the arm or axis, they partly rolled and partly were dragged; this was found so laborious to the horses, that the next effort of their ingenuity was, in the first place to make the sole convex, and next to make the middle rim of the tire or iron which binds the wheel, half an inch thicker than those on each side of it: by this means,

with all the expence and incumbrance of broad and heavy wheels, they are completely converted into narrow ones. But they are much more mischievous than narrow ones, because they are suffered to carry immense loads, and from their exemptions from toll do not contribute to the repair of the roads half so much as narrow-wheeled carriages, which do far less injury. On a hard road, where only the narrow rim has a bearing, they crush the materials; on a soft road, where by sinking, the whole surface comes into contact, they grind the materials into mud and dust, at a great expence of horse flesh.

If you remonstrate with the wheel-wright he will tell you, that if the wheel treads flat on the ground, as there is only one point at a time of the circumference that touches the ground, it is immaterial what the position of the remainder of the wheel is in, which is moving in the air: if you tell him to make a garden-roller in the form of a sugar loaf, he will find that though only one point, or rather line of the circumference touches the ground, while the remainder is moving in the air, it will, if moved at ease, revolve in a circle; and to move it in a right line, it must with difficulty be dragged; and if you cut off a frustum of it, it will still move in the same circle; he cannot deny it, but still he is not convinced.

Public roads will never be maintained in repair as they ought to be, until the legislature compel the use of cylindrical broad wheels; if once got into general use the roads will become smooth, and free from obstacles; when obstacles are removed, there is then an opening for further improvement; the wheels may be made one-half less in height, and consequently in weight. There will be a little more friction on the axis, but this is a trifling consideration, compared with the evils which I have described; the roads will be maintained at half the expence, and travelling carriages will move with ease and expedition.

In the formation of roads two things of material importance are unattended to; the one where roads are repaired with stone, is the neglect of breaking the stones, which ought to be left not larger than walnuts; I was ashamed for my country, when I saw this minutely attended to in a wild part of the north-west of Ireland: the other, which is still more important, the use of water on roads in wet seasons; on roads buried in mud, if accident turns on to them a little stream of water, such parts of the road are always the best. I must request of gentlemen who travel, to give some attention to this circumstance: on the turnpike roads numbers of men are employed in scraping off the dirt, and with it they scrape off much of the good

material; carriages are afterwards employed at a considerable expence to carry it off.

There are few situations where in rainy seasons water may not be collected from the ditches of adjoining lands, and be dammed up and turned on to the roads; this, by the assistance of one-third of the labourers that are usually employed, will effectually do more business than the whole of them in scraping; by washing away the fluid mud, and leaving the gravelly particles in the ruts, on the return of dry weather, if the water is turned off into the ditches, the road will dry more in one day, than with the mud on it will dry in a week.

Some miles of the road between Leicester and Northampton is managed in this way, though not so well managed as it might be; there are a few other instances of this practice, but none of them perfect. In the neighbourhood of Daventry their materials are so bad, that the roads would sometimes be impassable without the use of water; and they have from necessity erected pumps to raise the water where they have no other means of getting it.

In the late wet season, the road between London and Uxbridge, with the best materials in the world to make it, was almost impassable, while streamlets of water were running in the ditches, which in a few days, if they had been made use of, would have made it as good as any road in the kingdom. I have often thought of calling public attention to this subject, and am glad to seize this opportunity of recommending it to the consideration of the Board.

If any of the foregoing observations may be made useful, I shall be happy in having contributed my mite towards attaining the objects of your patriotic institution.

I am, Sir,

Your very humble servant,

No. 7, Chatham-Place,
March 19th, 1795.

W. JESSOP.

To Sir John Sinclair, Bart.

XV. *Hints on the Subject of Roads, from the Communications of Mr.* John Holt *of Walton, near Liverpool.**

SECTION I.

On the Advantages of good Roads, and the Laws respecting the same.

Among the many conveniences which are enjoyed by the present generation, the improved state of the roads, cannot be reckoned one of the least important.

But in works of such magnitude, the prejudices to be conquered have not been few, nor of trifling importance; yet the progress already made through the whole kingdom, in the formation of roads, within the last fifty years, and the consequent advantages reaped thence by the public, have indeed been great.

To point out some of those advantages, and the steps most likely to contribute to the further improvement of roads, with some hints for keeping the roads in repair after being made, together with such other observations as naturally arise from the subject, will be the attempt of the following memoir.

Those who have not tasted the inconveniences of life, have but too imperfect an idea of its blessings; nor can such as have always been in the habit of travelling with ease and safety over roads in their present improved state, have more than a faint idea of the toil and danger of passing over bogs and quicksands, or yet the more tremendous and roaring torrent;† or even the difficulty of travelling upon earth reduced to mud, in which state the best kind of roads must have been in a wet season, before they were properly made.

* Mr. Holt laid before the Board a paper of considerable length upon this subject; but his observations respecting the line of direction, the construction and form of roads, and the mode of their preservation and repair, are so similar to those of Mr. Beatson, that it would only have been a repetition of the same ideas to have printed them in this place.

† A tailor in Scotland, who in going and returning from his work had a river to pass, had experienced so many perils in his repeated passages, often in the dark, that he dedicated the savings of his whole life, for the purpose of erecting a bridge over that river, from which he had experienced so much danger, for the benefit of posterity. See Statistical Account of Scotland.

In the infancy of commerce, when it became necessary to transmit goods from place to place, no other mode presented itself, but that of conveying the load upon the backs of horses; efforts were made for their accommodation by a path a little elevated, and about three feet broad, and which just admitted the pack or gang to follow each other, but neither horse or man could pass in the winter season, the narrow space on each side of this elevated road (which was in itself only hard materials upon the earth cast up) being a mere bog. The traveller must therefore either take the advantage of beginning his journey early, to start before the pack-horses, to have the benefit of the elevated path, or submit to walk their slow pace, behind the gang or file of pack horses. To prevent these inconveniences in some degree, the leading horse was furnished with bells,* which by giving a distant notice of their approach, afforded an opportunity for the traveller on foot or horseback, to stand still in such places where accident or design had left wider spaces.

Travelling in carriages, except in towns, and near the seats of the nobility and gentry, was impracticable, therefore unknown, as was also the conveyance of goods in wheel-carriages of any description, except during the summer season; nay, so bad were the roads, and so few were the vehicles, that not less than fifty years ago, in the great road to Edinburgh and Glasgow, a carriage of any sort was such a rarity, that the whole people in a village went out to look at it, and the children would have followed it for a mile.

The late Mr. Thomas Knowles of Liverpool used to observe, that he once had the honour of driving every coach in the town of Liverpool (about fifty years ago, when there was but one). That the family having occasion to travel as far as Warrington, attempted it in their carriage; during the journey, the country was raised twice, spades and horses being necessary to dig and drag them out. Upon this very road, at this time (an. 1795), besides post-chaises, ten stage-coaches † pass daily.

Horses at last were found incompetent, and carriages became necessary to convey from place to place the increased quantities of commodities; but the roads were

* Bells might also serve to cheer the gang, and to direct the horses behind, and in the dark.

† When stage-coaches were first established, they arrived no nearer to Liverpool than Holme's-chapel, afterwards to Warrington; it is not much above thirty years ago since they were enabled to proceed as far as Liverpool. Previous to the establishment of stage-coaches the journey from Liverpool to London used to take up the space of fourteen days; since the establishment of mail-coaches the same length is run over in the space of twenty-eight hours.

insufficient. Great exertions at length were made, and large sums expended in these works, so as to render the roads capable of supporting, what, at one period, would have been deemed impossible. But to effect which, it became necessary for the legislature to interfere, and to enact compulsory laws.

The first law enacted respecting highways and roads was in the year 1285; when the lords of the soil were enjoined to enlarge those *ways* where bushes, woods, or ditches be, in order to prevent robberies. The next law was made by Edward III. in the year 1346; when a commission was granted by the king to lay a toll on all sorts of carriages passing from the hospital of St. Giles in the fields, to the bar of the Old Temple; and also through another highway called *Portpool* (now Gray's-Inn Lane) joined to the before-named highway; which roads were become almost impassable.

In the reign of Henry VIII. the parishes were entrusted with the care of the roads, and surveyors were annually appointed to take care of them.

The present existing laws relative to highways, are those made in the 13 of Geo. III. c. 78.*

But the increase of luxury and commerce introduced such a number of heavy carriages for the conveyance of goods, and lighter ones for the ease and convenience of travellers, that parish aid was found insufficient to keep the most frequented roads in repair. This introduced toll-gates, bars, or turnpikes, that something might be paid towards their support, by every individual who enjoyed the benefit of these improvements. The present laws relative to turnpikes are comprehended in one act (13 Geo. III. c. 84.), and a summary of them may be found in Scott's Digest, and in the book already referred to.

SECTION II.

On the Choice of proper Officers for the Management of Roads, and the Means of making and keeping the same in Repair.

However wisely formed laws may be, they are of little avail unless properly executed, and on this subject it is hardly necessary to observe, that much must depend upon the choice of officers appointed for that purpose.

* As there is an excellent summary of these laws in the Magistrate's Assistant, by a country magistrate, printed by R. Rakes, at Gloucester, it did not appear necessary to transcribe them here.

Next to the overseers of the poor, no office has been so difficult to fill with proper persons as the surveyors of roads. According to the act for regulating private roads, they are directed to be chosen annually every 22d of September, at a meeting of the householders convened for their election.

This surveyor formerly, and in some places to this day, continues in office but for one year. The duty being personal, they were (with some few exceptions) chosen in rotation, or as they lived in house-row. The inconveniences attending this mode may be easily conceived, and are sufficiently reprobated in the different Reports; for every business requires some previous information, however simple the operation.* But what knowledge could an individual be supposed to have of a subject upon which he had never turned his thoughts; and how indifferently would be, most likely, performed the duties of that office, upon which he entered not only with reluctance, but downright ill will? Under such circumstances, the duties of office were passed over as slightly as public clamour would admit, or hardiness of spirit could endure. The work was generally left to the care of some pitiful *road-maker*, and what little was attempted, might be for the convenience of the existing officer, or some of his friends. The work in short that was done was generally *ill done*, nor was the public good often consulted. The roads became repaired in certain places, like patches, with intervals between almost impassable. Succeeding surveyors followed the tracks of predecessors, quoted their examples, and by former proceedings vindicated subsequent misconduct.

Evils of such magnitude, frequently repeated, will effect in due season a cure, by enforcing the adoption of different measures. The absurdity of appointing officers, both unwilling and incompetent (through ignorance) to execute their duty, had been sufficiently proved. A standing officer, that is, some active person was selected, to whom a salary was given to stimulate his exertions, and from his experience gained by former services, was re-elected annually, till he himself either declined, or the public conceived he relaxed from his usual exertions.

* "A knowledge of the true principles is indispensably necessary in every art; and that of making great roads requires as much as any other; some preliminary pieces of knowledge are very necessary in every superintendent or surveyor. A beaten track of knowledge is but a bad guide, in cases which very frequently occur, where, amongst several ways, the best is to be preferred." Extract from an Essay on the Construction of Highways, by M. L. Haldimand, Secretary to the bailwick of Yverdon in Switzerland.

Men, indeed, of independent fortunes and independent spirits, have now and then stepped forward, and devoted their time and attention to the public service, in superintending the roads, without any expence to the community; but after a few years labour have generally retired, both wearied and disgusted; wearied it may be, by the capricious humours of individuals,* not capable of distinguishing their worth; and disgusted always with the difficulties necessary for enforcing an equitable discharge of the statute duty, of which more will be said hereafter.

Such as undertake the office for the sake of pecuniary emolument,† and out of which class the greatest number of officers must of course be selected, are but too often under the control of some superior, who probably exerts his authority in prejudice of the public. Although the dependent state of such a surveyor may be lamented, his conduct cannot be justified; but the influence of such "country resi- "dents" is reprehended by a writer of the present period in the following elegant and animated manner:

"What epithets, for example, would his conduct deserve, if he could procure the levies and statute labour of the parish, to be expended in making or repairing roads contiguous to his own house, or beneficial chiefly to himself or his tenants, while others of far more importance to the inhabitants in general, are left year after year almost impassable."‡

The surveyors of turnpike roads, are generally men of another description, being appointed to that office by trustees, and who are usually continued, till infirmity or misconduct render them improper to fulfil their duty. Amongst the variety of persons thus appointed, there must be variety of characters; and where the roads are already good, and the money raised by tolls abundant, abuses have been committed. The economy necessary in the infancy of roads, has no longer been preserved; nor the vigilance of trustees minutely inspecting the conduct of their officers, so frequently exerted. Under these relaxations, abuses by degrees have crept in, and hence the complaints against the trustees of roads, and the agents employed by them.

But these great works cannot be atchieved without great expence; and it becomes

* Some there are, and of this description not a few, who, in passing judgment upon other people's motives according to the scale of their own contracted sentiments, cannot imagine that any person will step forward on public service without private interest.

† The act allows 8 per cent. upon the money laid out.

‡ Inquiries into the Duties of Man, by the Rev. J. Gisborne, A. M,

a consideration of no small import, how the money to be raised for the execution of these undertakings may be so levied, as to fall equally on those parties who enjoy the greatest advantages. What the expence of making a road may be in some parts, will appear from the following extracts.

" The great road leading from Perth towards Dundee, and the branches leading to the harbours of Polgaire, Errol, and Inchbyra, measure 24 miles, and when finished, with all the necessary bridges, and including the purchase of some land, where it was necessary to form some new lines of road, cost £ 13,000. or £ 541. 13*s*. 4*d*. per mile."*—" The boulder stones are not broke but paved, the whole expence of which is from 1*s*. 2*d*. to 2*s*. per square yard, according to the distance from the materials."†—" The construction of roads in many instances costs from two to seven or eight hundred pounds a mile, and their annual repairs little less, sometimes more than one."‡

" The different modes of levying money or aid for the making and repairs of roads, as appointed by the legislature, are by law limited to a certain sum, by statute duty, or composition paid in lieu of that duty, or by tolls. There is another mode, but which seems peculiar to the Isle of Man, which, besides parochial labour, including three days labour from every house in the towns, amounting to 750, a proportion of the revenue arising from public-house licenses of about £ 180. and a tax on dogs of £ 70. amounting altogether to £ 1000. per annum." §

All laws fabricated by man must be liable to imperfections, no wonder therefore, in these different modes, there may be found some defects.

Assessments for wise purposes have been limited to a certain sum, except under certain circumstances, as when a road has been indicted and under a fine, and to be repaired within a limited space of time, and which, by a regular cess of 9*d*. in the pound, it is incapable; then, and in such cases only, may be levied a cess to an amount not limited by the law. In many cases where roads have been under neglect, the sum of nine-pence is found not adequate, and yet a higher sum cannot be raised without an indictment; yet as this process is attended with expence, it is better to be avoided; and the legislature after all may have acted wisely in restraining the sum to the ratio of nine-pence in the pound, in favour of the lower orders of society.

* Carse of Gowrie Report. † Lancashire Report. ‡ Homer on Roads, p. 79.
§ Isle of Man Report.

Statute labour is by the act required to be performed before any cess can be made. The duty under this denomination was probably devised as an indulgence to the tenant, on a supposition that it would be less burdensome to perform labour than to pay money; for this tax by statute fell upon the tenant, though exempt by covenant from other taxes. But since this period the value of labour has increased, and the value of money decreased; and all duties, services, or taxes, under whatever denomination, or by whomsoever paid, fall ultimately upon the proprietor of the land; therefore, though the duty be performed by the tenant, the landlord in fact pays for what is very indifferently executed. At the best, it is a species of feudal service, and which the wisdom of the age has almost universally abolished. But the law in some instances is absurd, as in those provinces where materials are to be purchased, and which are only to be obtained with ready money; but the money cannot be raised till the duty is performed. In this case the officer is in a dilemma; and it is the exaction of this duty that renders this office so irksome, that many people object to undertake the execution of it, solely from the difficulties attending the performance of the statute duty.

In the village where this is written, there are not a more orderly or well disposed body of people in the whole kingdom, nor can the statute duty more regularly and completely any where be performed; yet the writer of this, who has been surveyor of the public and private roads for ten years past, has found an equal and regular exaction of the statute duty, the most irksome and vexatious part of his office; and that too when aided by excellent and able assistants.

That this duty has been well performed, may be evident from the work done since the year 1785, when the roads were, some in a state of nature, some in a ruinous state, and under an indictment, and all in a bad state; yet with never more than a cess of nine-pence in the pound, the amount of which is only £67. 18*s*. 9*d*. and some years with a cess of only sixpence in the pound, or two-thirds of that sum, the greatest part of the turnpike road, two and a half miles in length, has been taken up, new modelled, and repaved, and made wider in several places where that was wanting, to which the trustees have only contributed £300. the rest has been at the expence of the inhabitants, who have taken up £100. at interest to meet the trustees, besides their statute duty, and a part of their cess.

The private roads, eleven miles two furlongs, have, some parts been paved, some parts been covered with hard materials brought from a distance, and purchased, as

slag, small pebble-stone, or broken pebble; some, those least public, and which have the least work upon them, covered with a red broken rock which the country affords, and which, though not durable, is not unpleasant; but the whole length of the roads have been laid out into a convex form, with drains on each side, and a foot-path.

There cannot be a stronger proof of the regular performance of the statute duty than the quantity of work executed; but there are always some exceptions to general rules, and if there be only one, that one is a burden upon the rest: but wherever statute duty is mentioned in the Reports or other works, it is with disapprobation.

" It may be deemed (says an excellent writer upon this subject) proposing too bold an innovation, to propose the rejection of a plan which has received the sanction of custom for more than two centuries;* but the most effectual method to procure a thorough amendment of the roads, certainly would be to abolish the statute duty, and substitute a regular assessment on occupation of so much in the pound as might be thought sufficient for the purpose, the money raised thereby to be employed and accounted for by the surveyor, who, as before hinted, should be rendered independent of every person but the justices. The antiquity of the expedient, which on trial is found not to answer the end it was designed for, cannot be a good reason for persisting in the practice of it. There is little doubt but the effect of this alteration would soon be visible in the roads, for as the money must be raised, there would be no temptation to omit spending it. An infinitude of trouble would be saved to the surveyor, and the only argument in favour of the present method, viz. that it is an advantage to the landholders, who at particular seasons have little work for their teams, will lose much of its validity when it is considered that teams must be hired for repairing the roads, and probably those very teams will be hired for that purpose."†

Another method of raising money is by the exaction of toll.

When the most frequented roads become so much travelled on as to require more expence in their construction than could be borne by the several districts through which they were carried, application was made to parliament to obtain leave to erect bars, and receive tolls from passengers, to raise money towards their construction and support.

* The team duty was established by the 2d and 3d of Philip and Mary.

† Scott's Digest, &c. p. 128. In that case also, the hiring would be optional, if inconvenient; whereas it is now compulsatory when the surveyor calls upon them, and causes the farmer sometimes to omit his own very necessary work.

The capital requisite for making the road, was generally subscribed by men of property and spirit, to promote the public good; the tolls were mortgaged to pay the interest of the capital borrowed; and if any surplus remaining, it was to be applied towards the liquidation of the sum raised.

Notwithstanding bars were erected, and the tolls collected with intent to ease different parishes, who could not otherwise have supported such great charges, popular prejudice was very great in opposing the payment of these tolls, so great, that it is in the memory of some people, what contests ensued when the passage was obstructed by a gate being erected. The liberty of a British subject was thought to be infringed, and British valour was exerted to defend it, and to oppose the encroachment.

In this first stage it became necessary to appoint some stout man to withstand these attacks, and collect the tolls. The strength of arm, frequently determined, whether the toll was or was not to be paid.

On the subject of tolls a gentleman in conversation observed, it would be better if all roads were made turnpike, or subject to toll, as every one would then contribute according to the use he made, the good he enjoyed, or the injury he committed, than which nothing could be devised more reasonable or equitable. He further recommended a consolidation of all the roads into *one whole*, as the only means of rendering the system of road-making more complete, and the improvement of the roads more general over the whole kingdom. Ingenious as this may appear in theory, and equitable and just in fact, solid objections may be raised against it; if the whole expence of roads were to be raised by tolls, many would not contribute that enjoyed great benefit. But more roads might be subjected to tolls than at present, the number of bars might be increased, and more advantageous situations for levying greater sums, by being fixed near to large towns, might be adopted; and the tolls themselves might in some instances admit of being a little enlarged. It is true, that in some places inconveniences might arise to those who might live contiguous to a bar, and on account of their proximity could not move without being liable to this tax. But such particular cases admit of an easy remedy; a power might be invested in the trustees, to mitigate the tolls to persons under such circumstances, either by lowering them to half price, or one quarter, according to circumstances; or by fixing a moderate annual sum to be paid, according to the customary usage made of the road.

With respect to consolidating the whole roads into one mass, however useful that might be, if properly executed, still great projects often prove great evils, owing to the

want of proper people to undertake what would require attention and exertion to be well managed. The hints however are important, and worthy of being introduced in an Essay on Roads.

SECTION III.

On Iron Roads.

From the advantages that attend the use of cast iron roads in the marling and improvement of Trafford moss,* it appears highly possible that the adoption of them for other purposes might be productive of general utility. The following observations, therefore, on that subject, may not be unworthy of the attention of the Board of Agriculture.

Roads laid out with wooden rails, or sleepers, are it is well known very common in different parts of Lancashire, for conveying coals from the mines in the neighbourhood of canals to the places where they are shipped. At Orrell near Wigan, some of those roads extend three miles or upwards. By means of them one horse takes with ease a waggon containing two tons of coals; and notwithstanding the continual repair a wooden road requires, the expence of which is very considerable, these have been found by long experience to be the cheapest method of answering the purpose. In some instances, cast iron roads have also been adopted, for conveying the coals in the mines below as well as above ground, but not as yet to any considerable extent. The rapidity with which carriages of the lighter kind move over these roads, and the ease they afford to heavy conveyances, immediately suggest the advantages that might be derived from them in public roads, where the adoption of them is not prevented by particular obstacles; but those advantages would be attended with others not less important. Travelling would not only be rendered much more expeditious, but also cheaper and perfectly safe; and though the assertion may seem extraordinary, the expence of these roads, made in the most complete manner, would not be more than that of a common turnpike.

The saving of labour in draught cattle would also be astonishingly greater, it being experimentally certain, that less than one half the number, would perform the same labour required from those at present employed.

* See Agricultural Report of Lancashire, p. 98. See also Clackmananshire Survey, p. 63; and the Northumberland corrected Report.

These roads should be double, or too distinct roads laid at a small distance only from each other, with frequent communications to each other, so as to admit not only of carriages passing different ways, but also carriages travelling the same way passing each other at pleasure. The iron should be cast in bars, and bedded or secured in stone. A road thus constructed could scarcely ever stand in need of repair.

The carriages travelling on this road must be adapted to the purpose; low wheels of cast iron would in general be most suitable, but this would not prevent the constructing of any kind of carriage, either for ornament or use, which the occasion might require. The most important objection that can be made to this attempt, arises from the inequality of the roads in this kingdom, and the little advantages to be expected from an iron road, where it meets with a steep acclivity. There are, however, many parts of the kingdom, and large districts of country, where this objection will not apply. In many places where it would apply at present, it might be obviated by a judicious change in the road; and lastly, it would not be unpracticable to overcome the difficulty, and by an expeditious mechanical contrivance, to raise a carriage proceeding on one level, to another considerably higher, on which it might prosecute the journey to a further distance.

It must be confessed, that the measure above recommended, however beautiful in theory, is liable to various objections. To render the scheme practicable, it must in some measure become general; but to reduce the great roads of the kingdom, in their present improved state, to be almost of no value, and at the same time to expect a total derangement of the present construction of all kinds of carriages, for carriages must all have the same kind of wheels, are acts of such magnitude as to require serious consideration.

If even these difficulties were surmounted, there must still be roads for the horses; and the projecting circle of the wheel must have a clear groove to run in, or the carriages would be liable to accidents.

The projections too, must necessarily be carried through towns and streets, which would greatly annoy foot-passengers and horses in the day, and particularly in the night.

Notwithstanding these objections, on particular occasions and in local situations, the scheme might not only be rendered practical but useful; *e. g.* from collieries to the neighbouring towns, which is only extending their original design.

Suppose the coal consumed in Liverpool, were conveyed in this manner from

Prescot, &c.; if a calculation were made of the saving in the wear of the turnpike roads from the removal of coal-carts, and the saving of horses by the lightness of the draught, the result would be a circumstance of no trifling extent in favour of the public.

In the neighbourhood of Liverpool, every yard length of iron road costs about half a guinea completing, with oak sleepers, iron bars, and a path for the horses; a double road would cost therefore double that sum, or say, two thousand pounds per mile.

One horse draws a ton and a half upon these roads; two tons are a heavy draught for two horses on our usual roads.

The dimensions, I think, are, bars of iron about three inches broad, and one inch in thickness.

The expence of making a four-foot horse-causeway, depends upon the proximity to or distance from materials. It is said in the Lancashire Report, that a paved causeway costs from 16*d.* to 2*s.* per square yard, in that county.

In North Wales, in Shropshire, and Staffordshire, though rail-ways are laid down by various methods, and of different weights, according to different situations, and the purposes for which they are wanted, yet the most common in use are, about a quarter of an inch thick, three inches broad, and the rib about the same height, the weight about 28 lbs. a yard, including both sides; the price they will be made for 14 or 15 shillings per Cwt. These roads are best calculated for small waggons of about seven Cwt. when loaded, and one horse will draw several of these, according as the surface is in regard to equality; on a level road of this kind, I suppose one horse would draw four tons or upwards. The expence of laying these down, will vary very greatly, according as circumstances occur, sometimes being done with stone, but most commonly with timber.

SECTION IV.

On Guide-posts, Guard-posts, Mile-stones, and Snow-Ploughs.

There are certain appendages to roads, as guide-posts, guard-posts, mile-stones, &c. which it may be proper to take some notice of.

Direction-posts—are particularly ordered by the act, but are frequently neglected, where very necessary, especially in lonely places, where there are not inhabitants but at a distance. The wise surveyor may deem such appendages quite useless, since every direction is well known to himself, and indeed should he conceive it possible that a stranger might travel that way, to whom directions would be acceptable, and so far discharge his duty as to erect posts as guides for their accommodation; it is not improbable but public clamour may be raised against these good deeds, for thus wantonly squandering the public money, because every inhabitant already knows the road to such and such places, and what have they to do with strangers, or what obligation to attend to their accommodation.

The best form for these direction-posts, are probably those most generally adopted; an erect post with arms across, according to the number of roads, placed in some elevated and conspicuous situation; the arms of which are usually painted white, the inscription with black letters, which should be made of a size as to be easily legible. The length or depth of the arms might in some cases be extended, with more directions than are usually given; distances from places, if any, of distinction in the vicinity should be noticed.

Guard-posts—graduated conspicuously, should be erected at any approach of danger, in places subject to deep floods. These posts should be graduated so as to denote the depth at the deepest part; the best hour of passing the current if the tide flows: and likewise guard-posts or stones, as may be necessary and sufficient for directing travellers in the safest track through the flood or running water.*

Mile-stones.—Another useful directory is the mile-stone, which, if not absolutely necessary, is an agreeable appendage to a road; but these are often so constructed, as to be almost illegible to the traveller passing rapidly in a carriage; they are often defaced, and that too immediately after being put up, probably by boys out of frolic more than mischief; but whenever this is the case, the injury done should be amended by the painter, who, if he should regularly travel a certain length at certain periods, to renew any letters defaced, whether upon guide-posts, guard-posts, or mile-stones; the expence is trifling, and would not probably on the whole be much

* The two end posts should not only note the depth at that place, but should have a reference to the comparative depth the deepest parts bear at each height of the water; and there should be width enough in the road there for any carriage to turn about and return, if it was too deep. The force of the current is likewise worthy of remark, as the depth is more dangerous if the current be strong.

dearer than those plates of iron, on which the characters of information are engraven, which, although not readily defaced, are not easily read.

The best construction of a mile-stone, observed in a journey of two hundred miles, was that on the road betwixt Prescot and Warrington, a sketch of which is here given, put up lately by Mr. Jordan; and which, though not original, does the surveyor no small credit.* And it is with pleasure that an opportunity offers to bear testimony to the abilities of one person, at least, who executes the duties of his office in a manner that gives general satisfaction; whilst there is a general complaint through the whole kingdom, that a surveyor's office is but too often made a sinecure place. Mr. Jordan is one exception, and the roads under his direction contain ample testimony of his skill and atttention.

* The following hints respecting the inclined plane, and other forms of roads, drawn up by that intelligent surveyor, may be worth preserving.

Objections to the Inclined Plane.

1st. The stones cannot be sorted in a proper manner, which being mixed, occasion the road to settle in holes; otherwise, if all the big stones are paved together, on account of the size, they leave a cavity for a horse-foot.

2d. There can be no pinning or protection to the border stones of the bridle-road, which are always plucking up by the cart, owing to the horse wishing to keep on the highest side, as every bound the wheel makes, it still slips to the lowest point, therefore the carriage is always drawing up hill.

3d. The friction is greater, on account of one wheel bearing against the shoulder of the axletree, and the other on the war-pin.

4th. In carrying thin manure, great part is slopped over the lower side, which, added to the accustomed slob, together with the great distances the water has to run, occasions at least three times the wet and dirt of the convex road.

5th. A top load of hay, straw, &c. often slips off the cart to the lower side, and is the cause of its being loaded a second time. Carriages must hang to disadvantage on the springs.

6th. The water having so little descent for the distance it has to run, gets in and saps the foundation, which the frost heaves up.

Advantages in favour of the Convex Road.

1st. The water has but half the distance to run, and leaves not a third of the slob, and what is left soon becomes dry.

And it is with pleasure it may be added, that there are several persons, men both of property and ability, who have lately stepped forward, and by their spirited exertions, have rendered essential service to their country, to a considerable extent, since this public spirit went forth.

Another form of mile-stone, noticed in the Survey of Monmouth, p. 20.

Description.—No. 1, contains the distance from the town left.

No. 2, the distance from that to which you are going.

N. for Newport. C. for Cardiff.

The centre explains itself. The foot contains the parish in which the stone stands.

The last appendage of a road which it may be necessary to take notice of, is that of a plough for clearing the road from snow, made use of in Sweden, the nature of which will be sufficiently intelligible from the annexed engraving (Plate XLV. fig. 1.); and the following description of it, transmitted by Mr. John Niven to the Board of Agriculture.

" During my stay in Sweden, I was informed, when they have a fall of snow, and the roads are almost impassable, they use their snow-ploughs, which clears the middle of

2d. The stones can be placed in their proper situations for sustaining the weight of a carriage, beginning with side-stones (being the largest) at the extremity of the arch, and rising up to the centre in progressive order with small stones, being best adapted to the horses' feet.

3d. The bridle-road is never run on by the carts, &c. there being a pinning of at least a foot from the gutter or channel-stones, to the border of the bridle-road.

Repairs of the Inclined and Convex Road compared.

The convex roads, paved since July and August, 1790, to October, 1794, between Liverpool and Prescot, including a piece facing St. Helen's church, length about $2\frac{1}{4}$ miles, cost about £12. 10*s.*

The inclined plane from the cottage near Low-hill (slag-road included) to the Old Swan, from the above dates, cost, length about $1\frac{3}{4}$ miles, paved in 1789, £157. 7*s.* 7*d.*

N. B. The inclined plane was set at a price to the paviers per rod, and badly executed.

I paved about twenty-five rods, near Prescot school, of inclined road, to give it a trial, in August, 1791, which has not cost 10*s.*; this I cannot say is quite fair, as the cartage is not so heavy or so much.

The convex road, paved with about eight inches rise to seven yards broad, and well backed, a carriage may travel on every inch of it with ease. If the sand be of a loose nature, I would lay it nine inches round, as it is apt to settle and work out at first.

the road, makes the snow fall back on each side of the road, and renders it more pleasant for travelling. Not hearing of any thing of the kind used in this country, made me anxious to see one; a rough sketch of which I beg leave to lay before you for the consideration of the Honourable Board. I understand, when they have a fall of snow, the farmers are obliged to clear the road the length of their farms; and they have constantly one of these ploughs on the road, with two or three horses, by which means the roads are kept open, with little trouble to men and horses."

Explanation of Plate XLV. fig. 1. *(the Swedish Snow-Plough).*

A. The shaft to yoke the horses by; generally two horses abreast, and one before.

B and C. Two sides, viz. three or four deals well nailed and jointed together; agreeable to the fall of the snow, they are more or less in height,—say, from three to four feet high.

D and E. The length of the plough, about fifteen feet long.

F and G. Two iron bars nailed to the bottom to make it slide easily.

H. A box made from side to side and filled with stones to keep the plough from rising.

I. The breadth of the plough, and generally as broad as it is wished the snow to be cleared off the road; from fifteen to twenty feet broad.

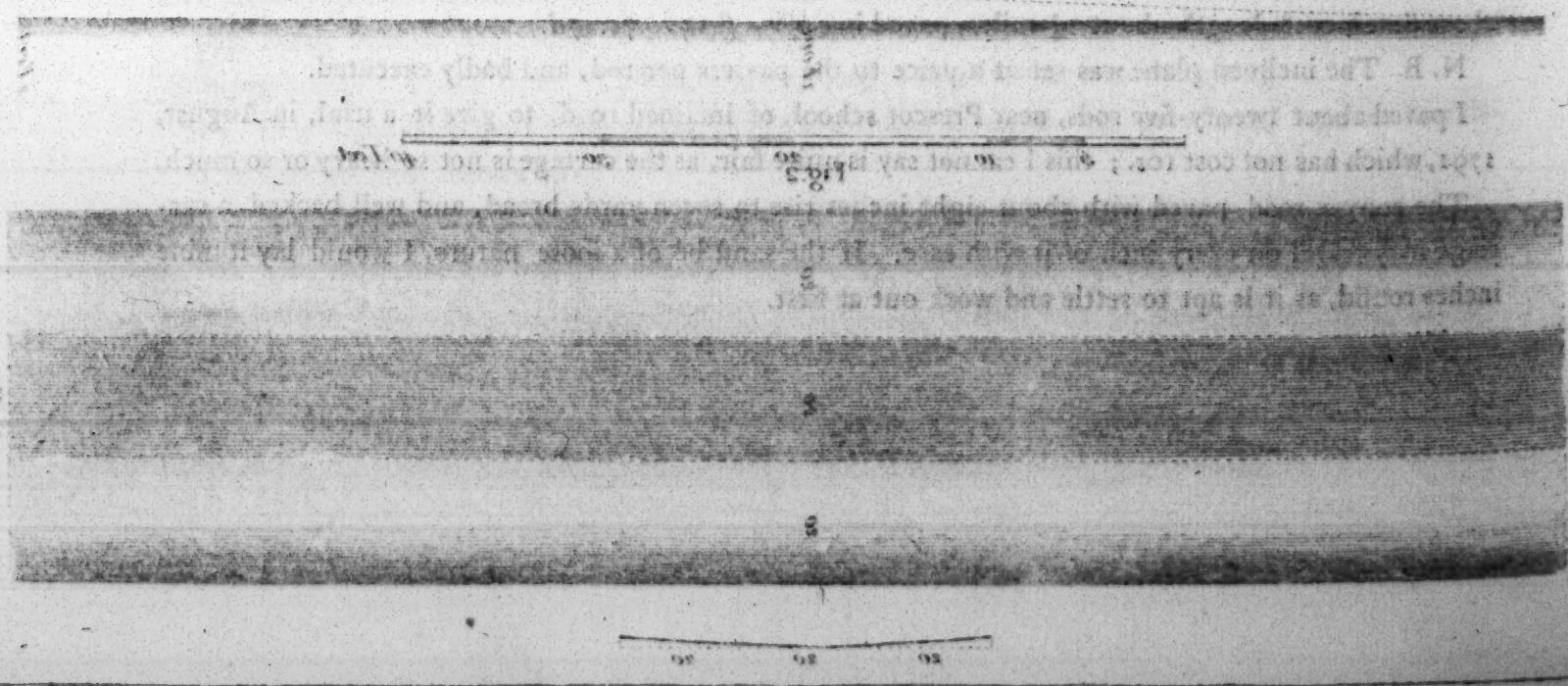


Plate XLV

A SWEDISH SNOW PLOUGH

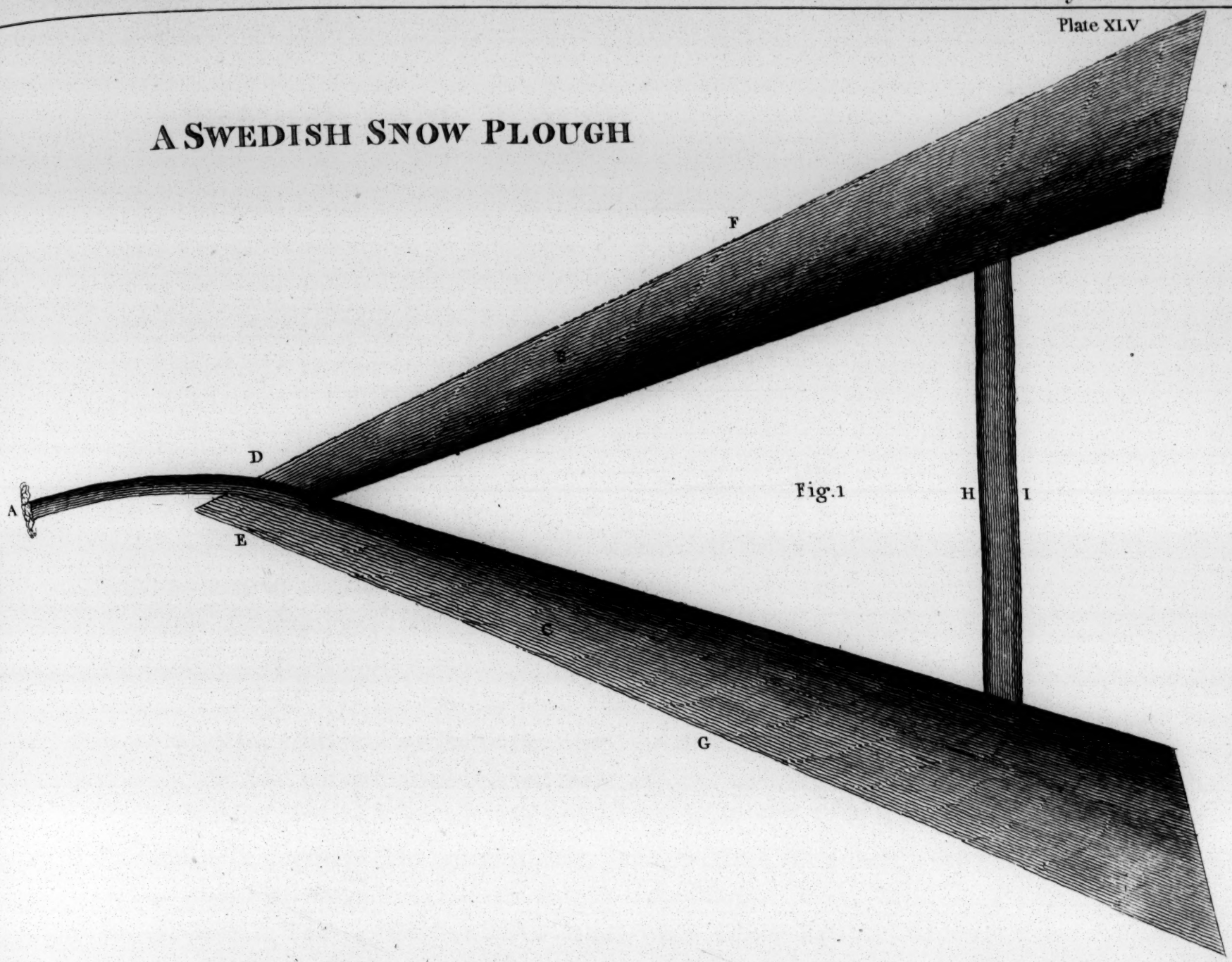


Fig.1

PLAN of the ROAD.

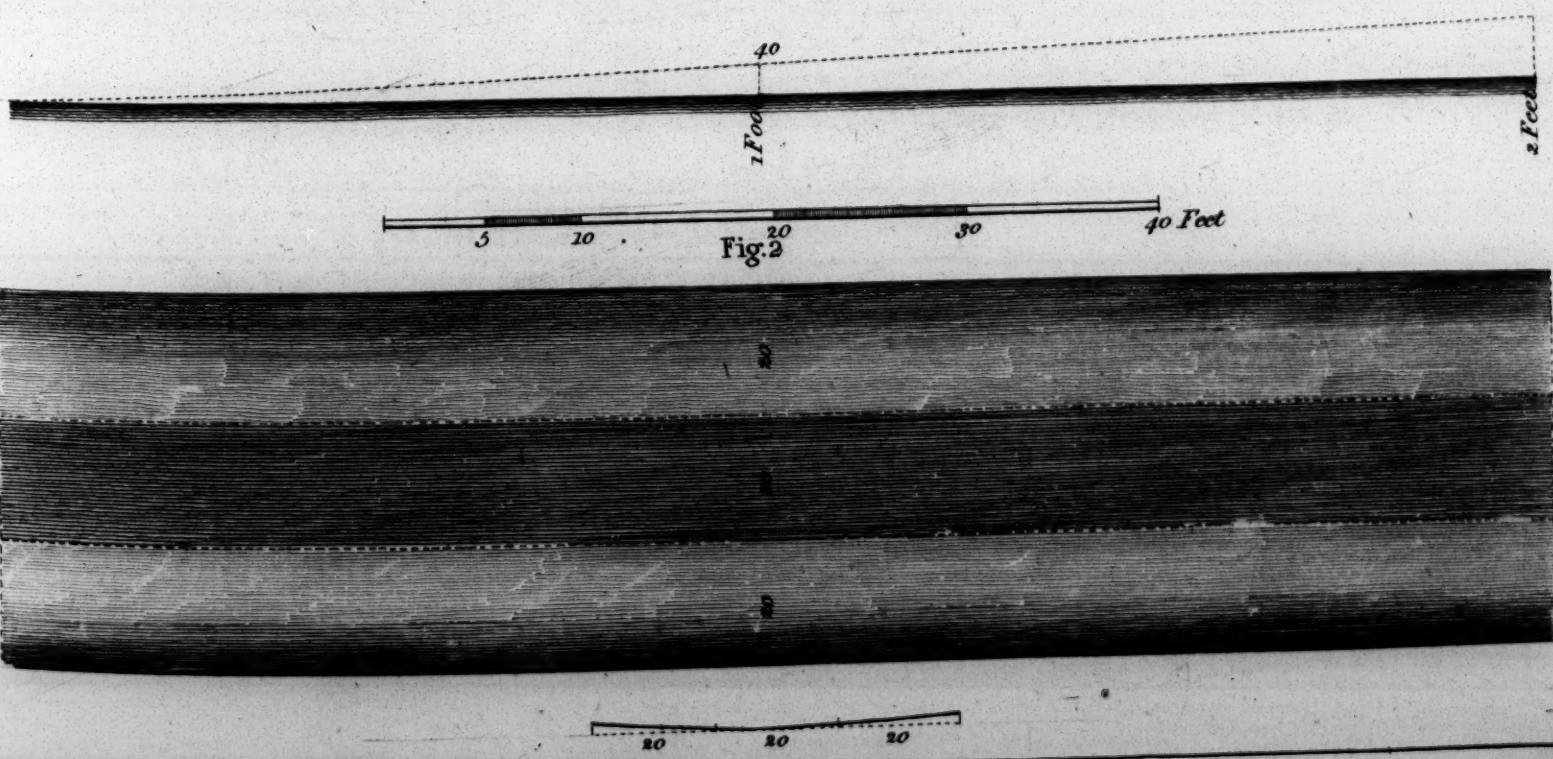


Fig.2

Veale sculp.t

XVI. *On Concave Roads. From the Communications of* Joseph Wilkes, *Esq. of Measham, in Leicestershire, to the President of the Board of Agriculture.*

SIR, Measham, May 26, 1796.

I WAS from home when your favour of the 3d came. I have taken the first opportunity to send you a plan and section of our best roads. I shall be happy if they are found to deserve any attention from your respectable Board; and I am ready to give any further information I can. I have been an acting commissioner on both concave and convex roads for more than thirty years. About that time a road was made from Burton to Measham, in the concave form, but then so little understood it was condemned; many other roads were begun about the same time, all made convex. The result is, the said concave road cost no more making, hath saved full one-third in repairs, it takes one-third less toll, has paid off one-sixth of its debt, and the road is the best in the country. The commissioners have long seen the utility of the mode; all the other roads have been, and are altering accordingly. Where the fall is gentle, say one foot in 150 or 200 feet, the inclined plane cannot well be too long, if a mile or more. In some cases I have known the water collected from roads, and turned upon grass, and its benefits would keep the road in repair.

I am, Sir,

Your most obedient humble Servant,

JOS. WILKES.

When the fall is one foot in 150 or 200 feet forward, the fall from the sides towards the middle ought to be 15 inches in 20 feet.

When one foot in 100 to 150, to be 12 inches.

One foot in 40 to 100, to be 10 inches.

One foot in 30 or less, to be even the whole breadth.

These roads should be carefully set out, well formed, and materials laid on true;

the more level, the less the wear. In many cases it may cost more to form, than a convex road, but it will save one-third of materials.

In order to make the road sound, in most situations, it is requisite to make a good ditch on each side the road, at least one foot deeper than the middle of the road; and in order to make it safe, the ditches should be made on the field side of the road; unless where it is sufficiently wide, then good earth ribs, three feet high, on the sides of the ditches.

QUERIES

As to Concave Roads, with Answers by Mr. Wilkes, *sent April, 1797.*

I have herewith subjoined answers to your queries respecting concave roads. The more any person considers the use and advantage of these roads, the more they will like them.

QUERIES	ANSWERS TO QUERIES
Relating to Concave Roads.	*Relating to Concave Roads. By Mr.* Wilkes.
1. In what year did the act pass for making the road from Burton to Measham?	1. The act passed in the thirty-third year of George the Second.
2. Where were the roads made upon this plan thirty years ago, to which Mr. Wilkes alludes in his letter?	2. From Burton on Trent to Measham, and Burton to Derby.
3. What roads have been altered from the convex to the concave form?	3. From Sawley Ferry on Trent, through Ashby, to Tamworth. Bosworth to Measham. Hinckley to Measham, and from Hinckley, through Melbourne, to Derby. Part of the road from Ashby to Tutbury, through Burton, and the road now altering from Measham to Atherstone.
4. What will in general be the difference of expence between these modes of forming a road?	4. In some cases less, in others nearly the same, or more; the difference, in the same situation, little, if any, in favour of the concave. As to the expence of forming, in either case the hills should be lowered, and vallies raised. The land is too frequently taken in a natural state for convex roads. The vallies, in concave

5. What inconveniences have been found to result from concave roads?

roads, must be raised, and the hills lowered, in order to carry the water to the greatest length on the road forward.

5. Not any. More convenient in all respects than convex, when properly made and attended to, and much less attention is required.

6. Are these roads formed on a dead level?

6. No. The road is, at little expence, made to have a fall, by raising one part and lowering another; in most cases it should be set out by a spirit level.

7. Have thunder showers the effects described on such roads, the dips being filled with the materials, and the plains loaded with puddle, and the sand and gravel driven in eddies?

7. Roads made according to the principles before mentioned, tear less by storms than any other. I have gone from Measham to Burton, many times, the very day after a violent storm has happened, and the road without the assistance of a man, has been so washed, without being torn, that a lady might have walked on it without staining her silk shoes.

8. Have these roads been found to be choked up with snow, more than convex ones?

8. Certainly not.

9. Are they more or less safe to travel upon than convex roads, in respect to carriages overturning?

9. Much safer.

10. Are there not instances where roads, being properly formed in the concave way, have made themselves by water, without any materials being brought?

10. In many instances, where sand and weak gravel abounds.

11. Has harrowing, to level the surface, for the water to flow over, been applied?

11. When the road is loose, after being made a short time, harrowing has been used with success, during the time the water has been flowing on the road.

12. Do you know of any instances in which washing roads, instead of scraping, has been successfully adopted, though the roads have not been formed with that intention?

12. Many instances, particularly the London road from Northampton to Leicester, and from Dunchurch to Coventry.

13. Have any concave roads been altered to the convex form, from experience that the latter is the better way?

13. The road from Cavendish bridge to Derby was so altered, owing to the road being very improperly set out and made; but no instance where it has been properly made, and springs cut off.

14. Has not ice forming, been found an objection to the concave and washing system?

15. Is it not a leading principle, that wherever water *flows* naturally in a road, it forms a good one, whatever the soil?

16. Does no objection arise from frost, and frozen snow, mixed with water? Nor from the water running in and enlarging ruts?

17. Is the method applicable to a flat country?

18. If water running in the road makes it, is not the operation confined to the centre, and consequently the benefit unequal?

14. Never, where the springs are properly cut off.

15. It is.

16. No objection can arise from frost or snow, as the water, after running down the road, is carried off; whereas in convex roads, is often lodged upon the surface. There should not be, nor is it intended to have, any small dribbling springs run down the road, as those will be chiefly cut off by the ditches on each side the road; but in streams occasionally, with the rains and water sometimes collected from the fields and turned on: these will prevent or reduce any ruts that may be made.

17. The method is applicable to all countries.

18. The middle part of concave roads should be flat, from 10 to 20 feet, according to the whole width, &c. so that the water spreads the dirt from each side, and easily finds its way to the flat in the middle, which hath a fall forward.

In order to prove that this system is pretty generally approved of, the commissioners, on many roads, are altering from the convex by degrees, and the new roads which have been made in this neighbourhood, have been conducted on this principle, according to the general opinion of public meetings; and I have no doubt but that, if generally adopted, there would be a saving of one-third of the repairs, besides the great benefit of the water to land-owners.

Explanation of Plate XLV. Fig. 2.

Width of road, 60 feet.

1 Foot of fall to each 40 feet in length of the road.

20 Feet from the sides towards the middle, to have 9 inches of fall.

The inner 20 feet to be flat.

XVII. *On Iron Roads, or Waggon-ways. By* J. F. Erskine, *Esq. of Mar.*

It is now twenty-eight years since a green-glass house was erected at Alloa, in the neighbourhood where I reside, which gives employment to a great number of people. As the coals which it consumes, are conveyed from the pits to the door of the furnace, by a waggon-way, which is thought to be the best in Britain, a description of it may not be unworthy the attention of the Board of Agriculture.

The sleepers are broad, and only 18 inches distant from centre to centre. A rail, of upwards of four inches square, is pinned down to the sleepers by an oak pin: over this rail, another of the same dimensions is laid, care being always taken to cross the joints of the lower rail. The whole is well beat up in good clay. On the top of the uppermost rail, there is a bar of malleable iron, of one inch and a half in breadth, and upwards of five-eighths of an inch in thickness. The waggons have wheels of twenty-seven inches and a half diameter, and these, with the waggon, are supposed to weigh from eighteen to twenty Cwt. A waggon contains one ton and a half of coals. Two waggons are commonly linked together by chains of two feet long; sometimes a third waggon is added to them; so that one horse draws four tons and a half of coals, besides near three tons weight of carriages; and the declivity of the waggon-way is in most places so gentle, as to admit the horse to draw the three empty waggons back to the coal-hills, at the rate of three miles per hour. Indeed one horse can draw, by extraordinary exertions, four waggons filled with coals; so that the weight, including the waggons, approaches very near to ten tons; which is almost incredible, as it far exceeds the weight of a broad-wheeled loaded waggon, which takes eight horse to draw it; for that, by the act of parliament, is only allowed to weigh six tons in summer, and five and a half in winter.

The advantages of dividing the load into several waggons, are very considerable. They are easier filled and emptied; and by throwing the weight over a greater surface, less damage is done to the waggon-way: at the same time, it is considerably easier for the horse, as it is well known that almost the only exertion which the horse has to make on a good waggon-way, is at the first starting of the waggon; therefore if the whole weight were put into one waggon, the difficulty would be almost insurmountable.

But as the waggons, when standing still, are quite close to one another, and the chains that link them together about two feet long, the horse has only two tons and a half to put in motion, for when he starts the first waggon, the impetus of it, if it does not actually move, at least greatly assists in moving the other waggons, with very little exertion of the horse. The first expence of making this road was considerable, being from 10*s*. to 11*s*. per yard, or between £900 and 1000 per mile. But the proprietor has been amply repaid; for although this road, which is full two miles in length, has been finished upwards of ten years, the repairs of it, during that period, has not exceeded the sum of £200. Hitherto, this kind of road has been used only for the conveyance of coal from the pits, or stones from a quarry; but perhaps the use of them might be extended for conveying all kinds of goods, from one place to another, as, in some particulars, they have advantages superior to canals; for frost little affects them, and less time is lost, than from the obstruction given to navigation by locks.

XVIII. *On Watering and Washing Roads.*

1. *On the Watering of Turnpike Roads in the Neighbourhood of London. By Mr.* Wright *of Chelsea.'*

THE roads that are watered in the neighbourhood of London, *by trustees*,* do not extend more than three miles, excepting the Brentford trust, which extends to Smallbury Green near Hounslow.

The watering roads is a complicated business, some being done by an additional toll from Lady-day till Michaelmas; others by an assessment on the inhabitants. No turnpike trust waters, except it is specially expressed in the act of parliament. The trustees of Kensington and Brentford have their roads done by hire; they have pumps fixed, which is attended with considerable expence, and water-carts of their own. The horses and men work by the day; and at the nearest calculation I can make, it costs six shillings and sixpence per mile every day they water, for the men and horses. The trustees of Islington keep teams of their own, which are constantly employed in leading gravel or watering the roads, and they find this mode cheaper, and more convenient. Those roads that are watered by an assessment on the inhabitants, are mostly done by contract. I am of opinion, that the mode of watering roads might be improved; the method now followed must in some degree injure them. The carts are drawn by one horse, which has not strength sufficient to pull so weighty a machine, laden with water, but is obliged to rest two or three times before the cart is empty; which causes torrents of water to rest on those parts of the roads, and occasions the holes and chasms that may be seen in all roads that are watered. The water-carts, in my opinion, should be drawn by two horses to go a regular pace, that the roads might have an equal quantity of water; the trough or cullender at the tail of the cart, is too far from the ground, and the consequence is, the water comes with too much force on the roads, which is in part the cause of those holes before mentioned. I am of opinion that a cullender might be contrived at the bottom of

* Many roads, in the immediate vicinage of London, are watered at the expence of the inhabitants in the neighbourhood.

the cart, and nearer the ground, which would water the roads more regularly, and might be stopped entirely when necessary. I differ in opinion with many, respecting watering roads, and think it advantageous, provided the roads are kept clean. When roads are moistened by a shower of rain, or a water-cart, the perpetual pressure of the broad-wheeled waggons must bind and firm them, and the narrow-wheeled carriages, at that season of the year, do not remain on the ground a sufficient time to injure them. If the roads were well cleaned in the spring, and the dirt and dust carted off, a small quantity of water would make them pleasant, without injuring them; but according to the present practice, the dust or mud is raked in heaps on the sides of the roads; there it lies to be consumed and blown about, which annoys both travellers and those who live in the neighbourhood.

The watering of roads, is so incidental an undertaking, that no judgment can be formed of the expence, but by the mile. If the repairing of roads were farmed, the watering would require but a small expence, compared to what it costs trustees. A contractor would have the benefit of all accidental showers which happen at this season, and no time would be lost, as his men and teams would be ready for any other kind of employ, when not wanted on the roads. Trustees mostly pay for the whole day, if the teams only work a few hours. I can only add, that the principal cause of so much dirt and dust is occasioned, not by watering, but by laying on too large a quantity of gravel at an improper season of the year, namely the summer, which does not bind, and is soon ground down to dust.

It might not be improper, to have an experiment tried in Hyde-park, where there is abundance of water to be had, and where laying the dust, would contribute so much to the health of the invalids of the metropolis. Let proper carts be constructed, with a cullender at the bottom of the cart, so that the water could not come out with such force, and it might be stopped at once, when they turn, or when the watering is not necessary. Let there be two horses instead of one, as it is too heavy a load for one horse when the cart is at all full; and let them water twice a day, at four in the morning, and at eleven, when the weather requires it; and it will soon be found, that a small quantity will not injure them, on the contrary, will bind the gravel, if it has been laid on in autumn.

2. *On Washing Roads. By Mr.* Ellis.

Roads upon which the traffic is considerable, and the materials for mending not of the hardest quality, are apt to be extremely dusty in summer, and loaded with mud in winter. The usual method of cleaning them has been by scraping; but to this mode there is a material objection, that much gravel is carted away, as it is not easy to separate the stones which are ground down from those which are only broken. The expence of thus cleaning is also considerable. These evils occasioned another practice, that of washing away the mud; this has been found cheaper, more effectual, and takes off only the particles ground too small to be useful. But it can be applied only in certain situations; there must be a declivity to prevent the water stagnating; it should run freely, but not with too great rapidity. Where brooks and streams cannot be turned in, which is often the case, reservoirs by the side of the road, answer the purpose, if prepared with attention.*

* These hints are presented, that the Board may shew their attention has been given to every circumstance concerning the roads of the kingdom, relative to which any communications have been made to them. It would be extremely desirable, to have more complete information on the subject of watering and washing roads, from some of their intelligent correspondents, who have paid particular attention to those subjects.

COMMUNICATIONS

TO THE

BOARD OF AGRICULTURE.

FOREIGN COMMUNICATIONS.

PART IV.

FOREIGN COMMUNICATIONS.

[JERSEY.]

XIX. *Translation of a Paper transmitted by the Agricultural Society of Jersey, to the Board of Agriculture, respecting the Jersey and Guernsey Method of Cultivating Beans and Parsnips.*

General Hints on the economical Utility of Parsnips.

WHETHER the cultivation of parsnips, on a large scale, is peculiar to Jersey and Guernsey, we cannot take upon us to say; but it is a fact, that in no other country in Europe are parsnips so generally cultivated, nor any where is so much use made of them to fatten cattle.

It is impossible to trace the period when the cultivation of this plant was first introduced amongst us. It has been known for several centuries, and the inhabitants have reaped such benefit therefrom, that for fattening their cattle and pigs, they prefer it to all the known roots of both hemispheres. The cattle fed therewith, yield a juicy and exquisite meat. The pork and beef of Jersey, is incontestably equal, if not superior, to the best in Europe. We have observed, that the beef in summer is not equal to that in the autumn, winter, and spring periods, when they are fed with parsnips, which we attribute to the excellency of that root.

All animals eat it with avidity, and in preference to potatoes. We are ignorant of the reason, having never made any analysis of the parsnip. It would be curious, interesting, and useful, to investigate its characteristic principles; it is certain that animals are more fond of it, than of any other root, and fatten more quickly. The parsnip possesses, without doubt, more nutritious juices than the potatoe. It has been proved that the latter contain eleven ounces and a half of water, and one *gros* of earthy substance, in a pound.* Therefore, there only remain four ounces and five *gros* of nutritive matter. Probably the parsnip does not contain near so much watery particles: nevertheless they digest very easily in the animal's body. The cows fed

* French weight is understood.

with hay and parsnips during winter, yield butter of a fine yellow hue, of a saffron tinge, as excellent as if they had been in the most luxuriant pasture.

Of the Cultivation of Beans and Parsnips.

Previous to speaking of their cultivation, perhaps it might be necessary to give a general idea of our method of ploughing in the island of Jersey; but this is not the moment to enter into details, and it will be sufficient to add, that some labourers plough their land three, four, and five years following, others six and seven; but most of them generally sow beans and parsnips the second year's ploughing, either after wheat or barley.

There are three modes of cultivation for beans and parsnips; 1st, with the spade; 2d, with the plough and the spade; 3d, with the small and the great plough. We shall only speak of this last method, the best and the most economical, and advantageous to the husbandman. It was first invented and practised by an intelligent farmer, about fifteen or twenty years ago. This plough, not yet sufficiently known, is of the greatest utility, either for grubbing up the ground, or ploughing deeply inwards, either to establish nurseries or plantations. The inventor deserves every thing from his country, and from mankind. If he had lived in an age, wherein merit and talents find protectors and encouragement, he would have received a reward for the invention of a plough which is, and ever will be, of universal utility.

In the month of September, a slight ploughing and preparation is given to the field, destined for beans and parsnips the ensuing year. In this country, this work is called *briser*. In the beginning of January, the field is ploughed a second and last time, with the small and the large plough; the first traces a furrow three or four inches in depth, and the second, which follows the same furrow, covers it over with ten or twelve inches of earth, very neatly, insomuch that one would rather think it had been dug with a spade than ploughed. Before they sow, the field is left eight or ten days exposed to the influence of the atmosphere.

Straight lines must be drawn from north to south, with a gardener's rake, at four feet and a half distance; on these straight lines, nineteen inches in breadth, women plant four or five beans in rows, four inches distant from each other; when this done, the sowing of the parsnips begins in broad-cast over the field, after which it must be well harrowed.

In five or six weeks the beans shoot out, and soon the ground will appear as if

covered by hedges, and similar to paths made for walking; for the spaces between the lines where the beans were planted are as many alleys, where women and children weed with greater facility. They generally weed the ground twice; this operation is done with a two-pronged fork, such as is used in gardens. The first weeding is performed at the end of April or beginning of May; then the plants must be cleared out; if they are too thick, the last weeding must be done about the middle of July. The beans will be ripe in August; they must be immediately plucked up, as it is in this month that the parsnips begin to acquire size; they have little more than foliage the preceding months, on which account the beans are less prejudicial, and that you may have two crops on the same ground.

The crop of beans is not always certain. If high winds or fogs prevail when they are in flower, the produce will be scanty: but the parsnips in a manner never fail; they neither dread the inclemency of the weather, nor are affected by the hardest frosts, nor by any of those accidents which at times will instantly destroy a whole crop.*

Cultivation of Parsnips and Beans in the Island of Jersey.

The cultivation of parsnips is considered as one year's crop, and is the first in rotation after wheat.

There are two modes of preparing the soil for the seed. The first is by means of a light plough, which cuts and turns the earth about four or five inches deep; then the same furrow where the plough has been is dug with a spade, which forms a trench of about sixteen inches depth; thus continuing till the whole field is ploughed and dug.

The plough that performs this work is supported by a fore part, with two wheels, the one on the right hand, or which runs in the trench, is fourteen or fifteen inches higher than the left wheel, which runs over the part not ploughed.

The second and quickest, as well as cheapest way, is by means of two ploughs, which render the spade unnecessary.

* Since the above communication, the following information was received from the President of the Jersey Society, dated 1st March, 1796; viz.

"Since writing to you concerning the crop of beans and parsnips together, we have found that an "individual who cultivates parsnips, without sowing either peas or beans along with them, had a crop "of 14,760 lbs. weight, Rouen measure, per *vergée*."

The *vergée* is 40 perches in length, and one perch in breadth.

After the same light plough, which serves to turn up the sod, has passed the first time, another large plough constructed on purpose, and only used for this operation, elevates the earth on the furrow laid open, and turns it over that which the small plough had turned up. It is found that this last method of preparing the field is as good as the first, if it be well performed, and particularly if the large plough be properly made. The essential point is to plough deep, and to cover the clods over again. This tillage is performed either with the light plough and spade, or the two ploughs together, about the middle of February, in high grounds, and in the middle of March, in the low lands.

The field thus prepared, is then left fifteen days in that state, after which it is very lightly harrowed, and on the same day, or the ensuing, the beans are planted in double rows all over the field, at the usual depth, and twelve feet distance from each other, and the beans spaced out eighteen inches from each other; when all this is done, the parsnip seed is sowed in the proportion of one *sixtonnier** and a half, on the space of ground named *vergée*, after which it is well harrowed.

In fifteen days after, if the weather has been warm and rainy, or in three weeks, if it has been cold and dry, it is harrowed again to cut up the weeds, which will have sprung up plentifully in that interval. The best time to do this is previous to the germs shooting out from the seed of the parsnip, or immediately after, before it is long enough to be cut by the harrow. If you harrow too soon, the weeds will not have sprung up, and if too late, you destroy the buds of your parsnips. This part is particularly important in stiff soils: it not only destroys the weeds as before mentioned, but keeps the ground in good tilth, and more easy to be weeded at a proper time.

If the parsnips are sowed about the middle of February, then it will be time enough to weed for the first time about the middle of May; that is to say, as soon as the earliest weeds are two inches above ground; and again in the beginning of July; then, and not before, the parsnips must be plucked up where they are too thick, leaving them at six inches distance on all sides.

The instrument used for weeding is flattened at the end where it enters the ground, *acéré* (suppose steel-pointed) four inches and a half long, a sort of little spade or large sheers, such as joiners use, of which the end is hollow to receive a wooden handle nine inches long, curbed in an obtuse angle at the upper part, to hold it better

* The *sixtonnier* is a measure of the country, about the twelfth part of a bushel.

in the hand. The weeder, with one knee on the ground, holds this instrument in his right hand, digs and turns the earth, and plucks up the weeds with his left hand.

The last weeding finished, no other work is necessary in the parsnip ground, but gathering the beans, which is done in September, when about half the husks appear dry. After Michaelmas, and not before, cattle are turned in to feed on the parsnip leaves; the proper time is when the leaves are diminished about one-third, or begin to dry.

Parsnips grow till the end of September, but some give them to cattle they wish to fatten in the beginning of September.*

The parsnip is certainly the most juicy and nutritious of all roots known. This cultivation is an excellent preparation for wheat, which is sown there without manure after parsnips, and yields a plentiful crop. It must be observed, that though this cultivation of parsnips is expensive, where the price of labour is high, no dung or manure is necessary, either for the parsnips or the wheat.

They reckon thirty *perches* of parsnips, with a little hay, will fatten an ox of three or four years old, though ever so lean; he eats them in the course of three months, as follows: they are given at six in the morning, at noon, and at eight at night, in rations of 40lb. each; the largest slit in three or four pieces; but not washed, unless very much covered with earth. In the intermediate hours, at nine in the morning, two in the afternoon, and nine at night, a little hay is given. Experience has shewn, that when cattle, pigs, or poultry, are fed with parsnips, they are sooner fattened, and are more bulky, than with any other root or vegetable whatever. The meat of such is most delicate and savoury. In spring the markets are furnished with the best and fattest beef, from their feeding on parsnips.

* We observed, in speaking of the Jersey method, that parsnips did not come to their full growth before the end of August; it is necessary to take notice, that Guernsey is less wooded than Jersey, and the beans thinner sowed, consequently the parsnips ripen sooner.

ANSWERS

From the Jersey Society of Agriculture, to certain QUERIES *transmitted by the President, respecting the Culture of Beans and Parsnips, the Management of Sea Ware, &c.*

Q. 1. *For what soils are the Jersey beans and parsnips most suitable?*

Ans. These are equally cultivated in Jersey, in a light sandy soil, as well as in stiff argillaceous land, provided that one and the other have depth enough to permit the parsnips to take a deep root; but we have observed, that both beans and parsnips delight particularly in a fat soil, rather argillaceous, but well divided by deep ploughing.

Q. 2. *We should be glad to know what is reckoned the best rotation of crops, in which these articles may be introduced?*

Ans. When the outward surface of the soil is exhausted by the production of plants with hairy roots, it is then proper to introduce a plant like the parsnip, which seeks its nurture at a great depth in the ground. On this principle, the parsnip should be cultivated after the first crop, on light soils, and after the second, in rich soils.

Q. 3. *What is the total produce and value of each, particularly of a good crop of beans and parsnips per acre?*

Ans. On an extent of 1000 feet, the produce of a field of beans and parsnips is about 12000 lb. weight of parsnips, Rouen measure, and thirty cabots * of beans, and three cabots and a half of peas;† which altogether, according to the price at which these articles are actually sold here, amount to the sum of 256 livres, French currency.

Q. 4. *Whether they are subject to any disease or insect, which frequently disappoint the husbandman of his crop?*

Ans. We shall confine our answer with respect to the parsnip, as the enemies of beans must be well known in England. The crop of parsnips seldom fail of being productive when they are cultivated with care. Their greatest danger is from too frequent rains. In the first fortnight after they are sown, we fear that the seed being covered with fine earth, it may be washed away by the torrent; in a more for-

* A measure containing half a bushel.

† We forgot in the former paper sent you to add, that it is customary to sow peas with the beans.

ward season, that the soil should be so hardened, as not to permit the plant to extend its root deeply.

Q. 5. *Whether the seed of the Jersey beans and parsnips can be procured in abundance, and at what price; and whether it will be necessary to have any person from Jersey to teach the mode of cultivation?*

Ans. The country produces seed enough for its wants; nevertheless it is sometimes scarce and sometimes plentiful, from whence the difference in price arises. Beans are sold from three to five livres the cabot, the parsnip seed from sixpence to three livres the *sixtonnier*. As to the latter part of the query, if the Board of Agriculture should think themselves not sufficiently informed by the details we have transmitted on the culture of beans and parsnips, or in the explanations contained in our letters, we make no doubt, that some one of our members, would find pleasure in going over, to give every information which the Board may wish.

Q. 6. *A model and description of the plough* (bluteau à grains), *and the other articles you mention, would be extremely acceptable.*

Ans. We are now busy in preparing these models; we are fearful of their not being executed with the requisite accuracy, particularly the model of the *bluteau*, the success of which depends upon its accuracy. We have not workmen here sufficiently intelligent to perform it according to our wishes.

Q. 7. *We should be glad to be informed whether your oxen are shod, and how they are fixed to the yoke in Jersey?*

Ans. It is only within these three or four years, that one of our members has given the method, as well as the example, of yoking bullocks to carts; he places them one before the other, on account of the local situation of the roads, which are too narrow to admit of their being placed abreast. He uses them in every branch of husbandry, and finds it answers very well. This method has been adopted by many farmers, but it is not yet so generally in use as it ought to be; probably, because oxen harnessed in this manner, require more care and attention from the driver, than horses, as being more stiff-necked, and only guided by a cord fixed to a chain, they do not yield so readily to the hand of the driver. We are now engaged in finding a method of driving them by the muzzle, which we conceive will be preferable to the common way. Large carts have always been drawn by oxen, between a double shaft, terminated by a yoke over the neck of the animal. The model of the improved cart, which we propose to send you, will shew this better than any description. As we are

obliged to put only one ox in a shaft, owing to the local situation of the country, the same member of our society, deemed it necessary to fix a yoke on the other oxen which draw before the shaft ox, that they might replace him without inconvenience. He has, therefore, applied himself to the perfecting the yoke, commonly called *jouquet*, and has made it as complete as possible; we propose sending a drawing of it to the Board.

The oxen are shod both on the fore and hind feet. The doing of this is difficult to be described in writing.

Q. 8. *We have heard it observed, that you make excellent use of sea weed in Jersey, either driven on shore, or cut on purpose. What is the plan you pursue?*

Ans. The plant named *le varech*, "quercus marina," in English, sea ware, or weed, or wreck,* is one of the most valuable plants for the purposes of agriculture. Without it, great part of our lands would remain uncultivated, or would yield very scanty crops. We have made use of it time immemorial, convinced of its utility. The major part of our labourers lay aside all other occupations, to procure it at the time of cutting it. The varech is considered of so much importance by the legislature, that they have regulated its distribution amongst the inhabitants, and appointed officers to attend to its preservation. It is only permitted to cut it at two periods of the year.

* The use of the *varech* as a manure, has been known above a hundred years in Jersey, as appears from the following extract.

"Nature, having denied us the benefit of chalk, lime, and marl, has supplied us with what fully answers the end of them in husbandry. It is a sea weed, but a weed more valuable to us than the choicest plant that grows in our gardens. We call it *vraic*, in ancient records *veriscum*, and sometimes *wrecum*, and it grows on the rocks about the island. It is gathered only at certain times, appointed by the magistrate, and signified to the people by a public crier on a market-day. There are two seasons of cutting it, the one in summer, the other about the vernal equinox. The summer *vraic* being first well dried by the sun on the sea shore, serves for fuel, and makes a hot glowing fire; but the ashes are a great improvement of the soil, and are equal almost to a like quantity of lime. The winter *vraic* being spread thin on the green turf, and after buried in the furrows by the plough; it is incredible how, with its fat unctuous substance, it ameliorates the ground, imbibing itself into it, softening the clod, and keeping the root of the corn moist during the most parching heats of summer. In stormy weather, the sea doth often tear up from the rocks, vast quantities of this weed, and casts it on the shore, where it is carefully laid up by the glad husbandman, there being particular officers appointed for the distribution thereof to all, by certain fixed and adequate proportions."

See *an Account of the Isle of Jersey*, by Phil. Falle, M. A. Rector of St. Saviour, and late Deputy from the States of the said island to their Majesties. London, 1694.

The first cutting is in the months of February and March, and serves as manure for pasture land, nurserymen's grounds, and fields sowed with barley. It is not decided upon what ground it suits best. It gives a surprising power of vegetation to plants in every kind of soil. Two cart loads, weighing two thousand pounds each, with six carts of stable dung, sufficiently manure a *vergée* of land of 1000 feet square.

The second cutting of the varech is in the month of July; it is then laid to dry on the sea shore, after which it is collected and housed for winter's fuel.

Exclusive of these two cuttings according to law, it is gathered at all seasons on the sea coast, by people who pick up what the sea throws up. They dry it on the spot where it is gathered; and though it is inferior to that which is cut, it meets with as certain sale; in a word, the varech is the cause that we scarcely ever have any poor amongst the country people.

The chimnies in which it is consumed, are much larger than for coal, and are furnished at different distances, from six to ten feet, with strong iron bars, to which are suspended pork lately salted, which is fumigated during three weeks or a month, after which it is deposited in a dry place for use. By this method it acquires a peculiar flavour and taste, superior to other pork smoked by means of coal or wood. It may be preserved during the whole year, and longer. They also smoke beef and fish in the same manner.

The ashes of the varech (alkali mixed with marine salt) make an excellent manure, particularly for stiff soils. It is judged that a cabot (half a bushel) strewed over a perch of land in the winter season, or at the beginning of spring, will be a sufficient manure. Our labourers are unanimous in opinion, that it gives a full ear to the corn, and prevents its being laid. In proof of the esteem in which the varech is held, although the island does not furnish above half the quantity of corn wanted for its consumption, those who have any varech to sell, may at all times get a cabot of wheat, for a *quartier* or six bushels of varech.

We must not forget to add, on the subject of the varech, that it is generally agreed upon, that what is laid on the soil by way of manure, has no effect on the ensuing crop, after that for which it is intended. This fact has been acknowledged by the major part of the farmers who have used it, without investigating the reason thereof. This interesting object now engages the attention of he Society. It has turned its thoughts on the principles which constitute this manure, and the causes of its short duration. We have supposed that the varech is composed of parts extremely volatile.

It was of consequence to impede its too quick evaporation; we knew that several other matters evaporate entirely when exposed to the air, such as camphor, &c. but when they were amalgamated with other ingredients, they retained longer their original principles. On these grounds, one of our members has collected a quantity of varech, which he has mixed with other manure, arranged alternately, *stratum super stratum*, which after having undergone a complete putrefaction, adhere, penetrate, and in a manner assimilate themselves with the volatile parts of the varech, to such a degree, that this compost, instead of having merely an annual effect upon the productions of the soil, yields a manure for several years following. Unfortunately this process, and mode of using the varech, is not generally followed, either from want of being known, or perhaps because old customs, to which our good farmers pay great respect, are different from it.

[THE NETHERLANDS.]

XX. *A Memoir on the Agriculture of the Netherlands. By the* Abbé Mann.

In this short essay, I shall endeavour to give the Honourable Board of Agriculture, such remarks on the state of cultivation in the Low Countries, as my long residence in those provinces has enabled me to make, or as I have been able to collect, from well informed persons, and of undoubted credit.

The characteristic features of the Belgic peasants are, *industry*, great *economy*, and a strong *attachment* to the methods and customs of their predecessors.

They are not perhaps so laborious as the peasants of some other countries, with regard to the quantity of labour they dispatch; but they are inferior to few in their constancy at it, and in the unwearied patience wherewith they endeavour to overcome the difficulties that arise in their way. No part of their time is spent in idleness; nor do they let escape any opportunity of gain which they can lay hold of. No object of this kind, be it ever so trifling, is to them indifferent; and though they be apparently dull and heavy in their behaviour, yet none are more clear sighted wherever their interest is concerned, or sharper in laying hold of what is to their advantage. They shew themselves, however, rather slow, in conceiving what makes against them.

They live with great economy, both as to diet, clothes, and lodging. They are utter strangers to the ease and elegance of English farmers. Their food is chiefly milk, soup, and vegetables: a piece of bacon, with their greens or roots, is their principal animal food for the greatest part of the year. At their feasts and *kermesses* a ham and a kind of pancakes called *woffels*, are their chief delicacies. Their drink is small beer, and a glass of cheap gin in the morning: wine is a great rarity with them.

As to their clothing, it is certainly warm and comfortable, though coarse and rustic in its form. On Sundays and holidays, when they put on their best attire, if it may be judged of by its fashion and shape, it may be supposed to have been worn by their grandfathers, so different it is from that of the towns in their neighbourhood.

Their dwellings have a particular form throughout a great part of the country. The dwelling house makes one side of the farm-yard; it is of three heights, one lower than the other, but joining together: two other sides are occupied by stables, cow-houses, and barns; the fourth side is the entrance, and railed in. The whole space within, except a narrow path of stones along the sides of the buildings, and of no easy passage, is the receptacle of dung and all sorts of manure, whereby the whole building is rendered dirty and offensive to the smell; but custom makes them insensible of it. The corn and hay-stacks are without, behind the barns.

Few people are more attached to their customs and practices than the Belgic peasants. They seldom change their methods of Agriculture, being persuaded that their forefathers were as wise and knowing as themselves, and that what they did, is the best themselves can do. Whatever may be judged of their manner of living, and of the form of their dwellings (in which, however, they are as contented and happy as the most elegant English farmer), it will easily be acknowledged by those thoroughly acquainted with the Flemish Agriculture, that their practices are far from being either bad or irrational: on the contrary, it seems that long experience has so well succeeded in adapting these to the nature of the soil, that it would be hard to do any thing better. During the many years I was at the head of an establishment which had many farms in property, and desirous to have them cultivated to the best advantage, I tried what experiments I could for this purpose. The intelligent farmers whom I often consulted on these heads, gave me satisfactory reasons, why the methods they followed, were preferable to what I proposed doing; and also why this would not succeed, as it proved in effect. The general result which I have been able to form, from what I know of the Flemish agriculture, is, that they draw from their farms the best crops, and the most food for great and small cattle, fowl, &c. which the soil is capable of producing. The quantity thereof is certainly great, when compared to any extent of land in Germany, France, Spain, England, or any other country I am acquainted with. The comparison, if made with due knowledge and impartiality, will certainly turn in favour of Flemish agriculture, whatever may be said in preference of the neatness and elegance of the methods used elsewhere, and of the usefulness of the new-invented machines employed therein.

What I have already said, is as much as this short memoir will admit of, on the general nature of Belgic agriculture. I shall now add a few words on the principles which the legislature follows with respect to it.

These are chiefly confined to the following heads: 1st, permission for exportation of corn in times of abundance, and restrictions in times of scarcity. 2dly, Ordinances for bringing corn to be sold at the markets, and for preventing it to be bought on the field, or at the farmer's. 3dly, Ordinances, in some provinces, for restraining the extent of farms, and prescribing a division of those of too great extent; also forbidding the destruction of farm houses, without rebuilding them.

With regard to the exportation of corn, the ordinances of government on that head are always temporary, and grounded on the reports made by the magistrates of the different districts, concerning the abundance or scarcity of corn, and specifying the quantity thereof: the great object being always to reserve in the country a quantity sufficient for home consumption till the following crop be reaped and fit for use. When exportation is permitted, the quantity of it is usually limited, and the ports and passages specified by which it is permitted to go out; from whence regular reports are made, and when the quantity permitted is passed, these are shut. I know of no laws to prohibit the importation of corn at any time; but in times of scarcity (which seldom happen) it would come in duty free, or even with premiums. As corn is but a partial culture in the Low Countries, the surplus that is produced, above what is necessary for home consumption, is not so great as what might be supposed from so rich a soil. In common years this surplus is not more than one-tenth or one-eighth of the whole produce; but in abundant years it may go to one quarter, or even one half of the whole.

The ordinances for bringing corn to be sold at market, are generally eluded: the corn is bought at the farmer's, he brings it to market, exposes it, and his first answer is, that it is sold. This is often the cause of murmurs among the people; but I know of no remedy found for it, except the prohibition of all exportation, which takes place as soon as a real scarcity is felt; and this in its turn excites the murmurs of the farmers, who have seldom any other view than their private interest, and who always having corn enough for their own use, never see a scarcity in the country.

Laws for restraining the too great extent of farms, or a monopoly of land, are not general in the Low Countries: the province of Hainault has solicited and adopted them with great success, as may be seen from the remarks given to me by the late Duke of Aremberg. Having treated this subject at length, by the express desire of that judicious and well informed prince, in a paper printed in Vol. IV. of the Memoirs of the Imperial Academy of Brussels, I shall only add here, that the farms in Flanders and

the other rich parts of the Low Countries, being seldom extensive, nay, for the most part small, no ground remains uncultivated; every part is put to the greatest profit: the farmers being at ease, but not rich, cannot keep back their crops, hence the markets are stocked constantly, not only with grain, but likewise with vegetables, milk, butter, eggs, fowls, hogs, &c. all which enter much more into consideration with them, than they can do in extensive farms. As this division of land into small farms, is a great means of increasing population, by encouraging marriage and industry, government constantly favour it; and expressly prohibits the letting farm houses fall to ruin, without rebuilding them, a thing many proprietors seek, for the sake of sparing the expence of rebuilding and repairs.

As to the methods of agriculture or the nature of crops, the government of the Low Countries takes no cognizance of them, but leaves every one to do what he thinks best; and certainly private interest and the love of gain are the best stimulants on this head, and seldom fail to excite each one to cultivate his ground in the manner, and with the productions, which he finds most profitable. Experience thereon is his only rule and guide.

The most universal land-measure in the Low Countries, is the *bunder* or *bonier*. In Brabant and Hainault it contains 400 square perches, or roods of twenty feet long, so that the square rood contains 400 square feet, and the bunder 160,000. The rood varies in different parts, as does also the foot, which in general is less than the English one. On an average the bunder may be reckoned three English acres. In Flanders land is usually measured by what is called a *ghemet* (a measure), containing three hundred square roods; the rood being in some places twelve, in others fifteen, Flemish feet long: but in some parts of this province, the bunder or bonier is in use, containing 400 square roods, as in Brabant and Hainault; but the rood varies in different cantons, from ten to twenty feet in length. The bonier contains four *journals* of land.

In the rest of this memoir, I shall treat briefly of the methods of agriculture in different parts of Flanders, Brabant, and Hainault, distinguishing them according to the different nature of the soil, and confining myself to such practices as are generally established in each. As the difference of climate is insensible within these limits, I shall prefer the order which results from the soil, to that of locality, as the practices of husbandry, in an extent of flat country not exceeding one hundred miles any way, are determined in a great measure by the soil alone.

The different soils I shall speak of are the following:

1st. The sandy heath of the Campine of Brabant.
2d. The parts of Brabant contiguous to the Campine.
3d. The strong clayey soil of Wallon-Brabant, and the northern parts of Hainault.
4th. The soil of the middle region of Brabant, being a mixture of sand and loam.
5th. The light sandy soil about Bruges.
6th. The rich loam of the districts of Ghent, Courtray, and Maritime Flanders.
7th. The artificial soil of the Pays de Waes.

The Campine of Brabant.

It is well known that the Campine of Brabant, which is the northern part of that province, consisted originally of sand covered with heath, interspersed with lakes and extensive marshes, and here and there with woods of fir. Tradition supposes it to have been once a part of the sea. To this day where cultivation has not extended, the soil of itself produces nothing but heath and fir. The sand is of the most barren and harsh kind, nor can it be rendered fertile, but by continued manuring. As the property of this ground may be acquired for a trifle, many have been the attemps of private persons to bring tracts of it into cultivation; every means have been tried for that purpose, and government has given every possible encouragement to it. But I have not yet heard of any one, however considerable might be his fortune, that has succeeded in it, and many have been ruined by the project. What is cultivated in the Campine, is owing to the religious houses established in it, especially to the two great abbeys of Tongerloo and Everbode. Their uninterrupted duration for five or six hundred years past, and their indefatigable industry, have conquered these barren harsh sands, and rendered many parts of them highly productive. The method they follow is simple and uniform; they never undertake to cultivate more of this barren soil at a time than they have sufficient manure for; seldom more than five or six bunders in a year; and when it is brought by labour and manuring into a state capable of producing sufficient for a family to live on, it is let out to farmers on easy terms, after having built them comfortable habitations. By these means, many extensive tracts of the Campine are well cultivated, and covered with villages, well built houses, and churches. The abbey of Tongerloo alone furnishes about seventy of its members as curates to these parishes, all of whom owe their existence to that original stock. I may add here, and that from the undoubted testimony of

the historians of the Low Countries, that the cultivation of the greatest part of these rich provinces, took its rise from the selfsame means, eight hundred or a thousand years back, when they were in a manner one continued forest.

A Campine farm of twenty bunders is stocked with two or three horses, seven or eight cows, some oxen, and is cultivated with coleseed, clover, rye, oats, and little or no wheat. It is hardly necessary to add, that potatoes, turnips, and carrots are cultivated not only in the Campine, but throughout all the Low Countries. But the culture of spergule *(alsine spergula major)* is more peculiar to the north of Brabant, though not confined to that tract alone. It serves the cows for autumn food, and the butter of this season is called *spergule butter*, of which the Campine furnishes a great quantity, especially to Brussels, where it is employed for the use of the kitchen, as being both cheaper and more profitable than any other, for that purpose. This plant is sown where corn has been reaped, after the ground has been lightly ploughed. Cows are tethered on it in October, and a space allowed to each one proportionable to the quantity of food which is proper for her. This pasture lasts till the frosts come on.

As spergule gives but little straw, and consequently little manure, the farmers supply the want thereof in the following manner: the peat or sods which are cut from the heath are placed in the stables and cow-stalls as litter for the cattle. The ground under them is dug to a certain depth, so as to admit a considerable quantity of these peat sods, and fresh ones are added as the feet of the cattle tread them down into less compass. These compose so many beds of manure, thoroughly impregnated with the urine and dung of the cattle. This litter is renewed at proper times, and that which is removed from the stables and cow-stalls is laid up in heaps, till it be carried into the fields where it is to be spread. This mixture produces a compost of excellent quality for fertilizing ground where corn is to be sown. By these means a far greater quantity of manure is produced from the peat, than could be had by burning it, as is done in some parts. In the Campine of Brabant the main object which the farmers have in view, is to obtain a great quantity of manure, without which all attempts to cultivate that barren soil are in vain.

Besides butter, the Campine furnishes the rest of Brabant, and Brussels particularly, with great quantities of fat fowl: the markets are constantly supplied with them, and they are preferred to any other of the same kind. They are not less sought for and esteemed in South Holland.

Many attempts have been made to plant woods in the Campine; but, fir excepted,

to no purpose, as they never grow up; and fir itself degenerates after it is thirty or forty years old; till then it thrives well.

The Parts of Brabant contiguous to the Campine.

There is no great farms in these parts, and hardly any such thing as tenants; each farmer is a proprietor; and as he cultivates his own ground, it is clear that he will do all he can to render it fertile without impoverishing it: far different in this respect from the tenant, who only seeks his own temporary interest, by forcing the soil, during his lease, if he has no assurance of renewing it, indifferent how much he may impoverish the land for the future.

There are many meadows in these districts, which give regularly two crops of hay, one at Midsummer, the other towards the end of August. It is not observed that frequent mowing impoverishes those meadows whose soil is deep and fat. If others of inferior soil appear spent, the custom is to sow them for three succeeding years with oats, and the last thereof mixing clover with the oats: by this means they become excellent meadows anew.

In proportion as the ground rises from the meadows, it diminishes in goodness, becoming at last a rough brown sand, mixed with pebbles; and under this is a stratum of compact clay, through which water filtrates with difficulty. Such ground as this gives small crops of rye, but it is excellent for black or Turkey wheat *(bled Sarrazin)*.

The productions of this part of the country are wheat, rye, barley, oats, and Turkey wheat, and as food for cattle, spergule, clover, turnips and potatoes. They cultivate also rape, coleseed, and flax, chiefly for their oils; and also tobacco. I shall add a few observations on some of these.

The good corn land of this canton never lies fallow; the only rest that is given it, is to let it lie a year in the clover that was sown on it with the corn the preceding year; and then it returns again to corn, which is produced in its former abundance. It has been observed likewise, that the best crops are produced when the corn is sown thin.

Turkey wheat, made into paste, and fried with fat bacon, is the ordinary food of the peasants of these parts, and also of the Campine. It serves them likewise for fatting their fowl; of which, as was said above of the Campine, they feed great quantities for the markets of the rest of Brabant and of Holland.

Great quantities of spergule are likewise cultivated in this district. It is sown im-

mediately after the corn is reaped. This plant is excellent in the latter season for cows; it is wholesome, and increases the quantity and the goodness of their milk, and the butter made from it is fatter, and keeps better, than that made from grass in May and June. Spergule serves likewise for manure in light soils, on account of its succulent and fat nature; being ploughed down while it is still green, it serves as a partial amendment for sowing wheat on the ground.

Clover is sown along with rye, barley, oats, wheat, and even with flax. Clover seed is a great branch of commerce in this country. When they do not choose to let the clover grow up for seed, it is cut at least three times in a year. After the last cut, the plant is ploughed under, and makes a good manure, and with a little dung added to it, wheat or rye are profitably sown on the ground.

Turnips and carrots are sown indifferently with any sort of corn; insomuch that in autumn, after the corn is reaped, the fields appear covered with them; and it is observed, that those which grow in this manner, are better than those planted in gardens, and are an excellent and healthy food for both men and cattle.

Potatoes are here likewise of great use for both. Their culture serves to amend ground newly broken up, by dividing and lightening its too compact parts, and rendering it thereby proper for sowing rye on the following year.

Coleseed *(colza)* and rape require a strong soil, and rather dry. Flax exhausts the ground, and is detrimental to the culture of corn on it. Tobacco produces a still worse effect of the same kind.

It has been found of great use in this part of the country, to divide the land into small fields, inclosed with ditches and quickset hedges, which shelter the vegetation from the dry winds and frosts of the spring; nor are they less useful in long droughts, for the same reason. The ditches are receptacles for the water which runs off in rainy seasons, and contribute also to the growth of the hedges, which are cut for fagots every five or six years. Oak, beech, birch, poplar, hazel, &c. are planted for these hedges, the growth of which is kept down by frequent cutting.

The woods of this canton are composed of oak, limes, beech, elms, and poplars of several kinds, as is the case in the greatest part of Brabant. Ash and holley are seldom seen.

Wallon Brabant, and northern parts of Hainault.

The soil I shall speak of under this head, is in general a cold compact clay, almost impenetrable to rain, and in droughts hard and full of cracks. In ploughing, the fur-

rows are made from eight to twelve feet in distance. Lime and marl are found to be the best manures for this ground, which is manured one year in three. Long experience has shewn, that the earth, after ploughing, must not be too much broken; for if it be, the rain forms it into an even compact mass, which afterwards dries and hardens, so as to become like one of the barn-floors of the country; whereas, when the earth is left in clods, these crumble away insensibly during winter and spring, and thereby cover gradually the roots and young stalks of the corn.

Culture of Wheat.—The ground whereon wheat is to be sown, is completely dunged, and ploughed five times; the first time in November, the second in March or April, the third at Midsummer, at which time the dung is spread on it, the fourth in August, the fifth and last in September. Four raziers, weighing 100 lbs. each, are usually sown on a bunder, which gives in its turn fifty raziers, when the crop is good. When lime is used for manure, four waggon loads are usually laid on a bunder.

Rye.—This is sown on land that has been dunged and sown with wheat the foregoing year. Two ploughings suffice. The sowing is begun about the 20th of September, if the weather permits: and in the spring clover is sown on it. The crop is usually ripe in July.

Meteil.—Wheat and rye sown together are called Meteil. This mixture is sown, like rye, on a ground that has borne wheat the preceding year, and which has been ploughed in the same manner. The sowing and reaping time of meteil are a little later than those of the rye.

Oats.—They are sown preferably on land which has borne clover; and in this case one ploughing suffices.

Clover.—Clover is sown along with wheat and rye; 20 lbs. of seed are used for a bunder. An artificial meadow of clover, remains good for two years; but in the spring of the second year, forty tubs (cuvelles) of ashes, each weighing about 60 lbs. are spread on a bunder: but this quantity varies according to the season and the nature of the ground.

Potatoes and *Carrots*—Are great articles of cultivation in these parts, and used for both men and cattle; but the methods have nothing peculiar.

Turnips—Are sown on a well dunged ground, about the middle of July; and before the end of September, if the season be favourable, they are fit to be given to the cattle, who feed partly on them as long as they remain good.

Horse-beans, Peas, Vetches.—All these are cultivated in these parts of the Low Countries, without any material difference in the manner from what is practised elsewhere.

Colzat or *Coleseed.*—It is sown about the middle of July, and the young plants are transplanted about the end of September. This is done with a narrow spade, sunk into the ground, and moved with the hand forwards and backwards, which simple motion makes a sufficient opening to receive the plant: a boy or girl follow the labourer with plants, and putting one of them into each hole, treads against it to close it up. If the plantation is done with the plough, the plants are placed at regular distances in the furrow, and are covered with the earth turned up by the succeeding furrow. Some time after the coleseed is planted, the foot of the stalks are covered by means of a common spade or hoe, with the earth near it, which furnishes nourishment for the plants during winter, by the crumbling of these little clods of earth over the roots. The coleseed is reaped about Midsummer, or later, according as the season is more or less advanced: it is left on the field for ten or twelve days after it is cut, and then thrashed on a kind of sail-cloth spread on the ground for that purpose, and the seed carried in sacks to the farm. When the crop is good, a bunder produces about forty raziers of 80 lbs. weight each. It is to be observed, that the ground whereon coleseed is to be planted, must be dunged, and twice ploughed, the same year it is put in use.

Flax.—The land for sowing flax, must be carefully cleaned from bad weeds, and well dunged. Some farmers, for the sake of getting better crops of flax, sow it on clover ground, which they dung towards the end of September, and plough afterwards. 180 lbs. of seed are sown on a bunder as soon as spring comes on. When the flax is about four inches high it is carefully weeded, without which precaution the weeds would stifle the plants; and this is repeated as often as the weeds get head anew. When the crop is good, a bunder yields about 400 lbs. weight of flax. The flax of this part of the country, is much inferior in quality to that produced about Courtray and Menin.

In these parts of the Low Countries, the farms are usually much greater than in Flanders, and in the middle region of Brabant, where the land is richer. In Hainault, all farms of above seventy bunders have been divided; but this has not extended to Wallon Brabant, where there are still many great farms.

A farm of seventy bunders is usually distributed as follows: ten bunders of mea-

dow, ten of wheat, twelve of rye, three of winter-barley, one of spring-barley, eight of oats, four of horse-beans, peas, and vetches, and eight of clover; which together make fifty-six bunders in cultivation, the other fourteen lying fallow, in all seventy bunders. For cultivating such a farm, eight horses are necessary; and it is stocked with sixteen cows, twelve oxen, and a flock of two hundred sheep; besides hogs and fowls in proportion.

The Middle Region of Brabant.

The land is here a mixture of sand and loam, which make an excellent light soil, but not so rich as that of Flanders, though preferable perhaps for corn. The usual productions of this part of the country are wheat, rye, oats, barley, beans, peas, vetches, clover, turnips, carrots, and potatoes. No ground here lies fallow; the farms are seldom extensive: forty bunders may be taken for an average. The distribution of a farm of this size is usually into about six bunders of meadow, and thirty-four of arable land.

These last are manured almost yearly, with from twelve to sixteen waggon loads of manure to each bunder, those in clover excepted. On these it is usual to spread, in March, turf-ashes brought in boats from Holland. From 80 to 100 tubs of about 60lbs. weight each are employed for a bunder, one-third of which is kept to be spread after the first cut. Many of the Flemish farmers make great use of these ashes, which being highly impregnated with salts, enrich the land so as to render it capable of producing excellent crops of wheat, without any other manure, except turning under the clover it was sown with the preceding year.

In most farm yards, a deep ditch is dug near the cow-house, into which the urine of the cattle runs, and a sufficient quantity is gathered, for spreading over two or three bunders, which proves an excellent manure.

The arable part of such a farm as I am speaking of, is distributed as follows: five bunders of wheat, five of rye, two of meteil, two of barley, four of oats, two of beans, peas, and vetches, five of clover, four of turnips, carrots, and potatoes, and five of coleseed; in all thirty-four bunders, the other six being meadow.

The following rotation is used in the culture of these parts: the ground being well manured, the first year coleseed is planted; the second year it is sown with wheat; and the third with rye, without dunging. From two to three raziers of wheat, of 80 lbs. each, are usually sown on a bunder; and when the crop is good, it yields from thirty to forty raziers of the same weight.

Some farmers spread turf-ashes on the ground where they have sown turnips and carrots, as well as on that sown with clover, &c. and then pass the harrow over it.

In a favourable year, a journal (a quarter of a bunder) of land well manured will produce from fifty to sixty sacks of potatoes.

Those that feed sheep in the districts where no land lies fallow, feed them, as well as their other cattle, with corn, beans, peas, vetches, turnips, and other roots.

Agriculture of Flanders; and first in the Environs of Bruges.

The quality of the soil, varies greatly in different parts of the district of Bruges, although the main constituent of it be every where a light sand. In many parts, continual manuring and cultivation, have rendered it extremely rich; in some spots, for want of these, it is less so, but a more extensive population would soon bring them into the same state as the rest.

There are many large farms in this part of the country, belonging in general to the rich abbeys; those of lay proprietors are for the most part less; and those of which the farmers themselves are proprietors, are still smaller. The culture in these cantons is regulated as follows:

A ghemet or measure of land, is manured the first year with dung, or, near Bruges, with a boat load of street-dirt from that city; it is then sown with flax; the second year wheat is sown on it; the third year rye; the fourth year it is again slightly manured, and sown with oats or Turkey wheat, and sometimes with clover, turnips, carrots, parsnips, or potatoes.

Clover is sown along with oats, and only lasts a year: it is afterwards ploughed, manured, and sown with wheat or flax.

Broom is sometimes sown as an amendment for bad land, and pulled up at the end of the second year, during winter. The ground is then dunged, ploughed, and cultivated with later crops, sown in the spring.

Turnips, carrots, parsnips, and potatoes, supply in these parts the want of meadows, and great care is taken to preserve them during winter for food for their cattle. Turnips, carrots, and parsnips are laid in the earth, in round heaps, of eight or ten feet in diameter at the bottom, and five or six feet high; when the first layer is placed it is covered with long straw; and so on alternately to the top. These heaps are opened in the winter or spring, according as the farmer has need of them for feeding his horses and cows; they are given likewise to early lambs, when young grass is wanting.

Potatoes are kept in deep holes dug in sandy ground, where they are seldom hurt by ordinary frosts, and keep good till far on in the spring.

In this tract of country, there are many little woods of oak, elm, beech, oller, and here and there fir of the maritime kind. Great quantities of willows are planted, and some are let grow up into trees, out of which are made windlasses for the boats and barges of the country: these sell dearer than oak.

Lands on the Rivers Lys and Scheld, from Menin and Courtray to Ghent and Dendermonde, and also of Maritime Flanders.

The soil on the flat banks of the Lys and the Scheld is reckoned among the best in Flanders: it is in general a rich, sandy, moist loam, become almost black with a long and uninterrupted cultivation. Hardly any great farms are found here; those of from sixty to eighty ghemets are counted the greatest, and they are generally less, as the land is richer.

In the largest of these farms, there are seldom more than three or four horses, and ten or twelve cows. The farmer employs from twenty to thirty waggon loads of dung for three ghemets of land, and only fifteen or sixteen loads, if it be street-dirt from the great towns, or turf-ashes brought by water from Holland.

These lands produce grain of every sort in great abundance, as also every kind of esculent roots, which are given to the cattle in winter, along with their hay. The meadows along the rivers, and in other parts of this rich and moist soil, are superiorly good, and the clover is the most luxuriant I ever saw. It is usual to spread, in the spring, sixty sacks of turf-ashes on three ghemets of clover sown the preceding year, which proves an excellent manure to it.

A great branch of culture in these parts, and particularly in the districts of Courtray and Menin, is that of flax, of which they produce an immense quantity, and of the finest kind. The expence of this culture is great, the labour bestowed on it in weeding, is almost uninterrupted, and the damage it does to the soil in exhausting its vegetable juices, is beyond measure; but in return, a good crop will almost buy the ground. To recover the soil after a crop of flax, clover and spergule are sown on it, and turned down for manure.

The plough used for this fine light soil, has a little wheel and an immoveable sower: one horse serves to draw it, or two at most in the strongest of this ground.

Lands uncultivated, and fields lying fallow, are here unknown. There are few

woods in this part of the country; but all the fields are inclosed with hedges, and thick set with trees, insomuch that the whole face of the country, seen from any little height, seems one continued wood.

The agriculture in Maritime Flanders is much the same with that now spoken of, as the soils of each bear a great resemblance; only that near the sea is more moist, the meadows are more extensive, and little or no flax or spergule are there cultivated. If there be any material difference between these soils, it consists in the greater quantity of marine substances, which enter into the composition of the soil of Maritime Flanders, than of that in the inner part of the country, and these add to it an additional degree of fertility.

The castlery of Furns, and the environs of Dixmude, abound more in excellent meadows than any other part of the Low Countries: the number of horned cattle fed there is immense, as is also the quantity of butter produced and sold, chiefly at Dixmude market; and it is of the best quality both for richness and keeping.

The Pays de Waes.

The land of Waes is the district lying on the north side of the Scheld, between Ghent and Antwerp; it is a perfect flat, and is reckoned the richest part of Flanders. The original soil was pure sand, and its present state of fertility, is owing to the great number of its industrious inhabitants, who cultivate a few acres round their dwellings, of which, for the most part, they are proprietors. The natural meadows are rich, and the great number of cows which the inhabitants keep, furnish manure in great abundance; but they are not content with this alone; great quantities of turf-ashes are brought thither from Holland, as also a great part of the street-dirt and dung from Brussels, Antwerp, and Ghent, besides what is had from the many rich and populous towns and villages, with which this district is covered.

The farms being so very small, few horses are kept in the land of Waes; the ground is chiefly worked with the spade and hoe, which the extreme lightness of the soil renders easy. If a plough be used, it is of the most simple kind, without wheels, and drawn by one horse. All these contribute together to give a richness and fertility to the soil of this tract, which surpasses almost what can be imagined. No spot lies uncultivated.

The common method of culture is as follows: a bunder of land is manured, once in seven years, with from forty to fifty cart loads of dung, and town dirt. The first

year it is sown with hemp; the second with flax; the third with wheat; the fourth and fifth with rye; the sixth with oats; and the seventh with clover, Turkey wheat, turnips, or carrots. Fallow ground is unknown here.

Spergule is sometimes sown about mid August, on land that has borne wheat; and in October the cows are put into it. The spergule which they cultivate for seed is sown in March, and reaped in June.

It is to be observed, that the riches of the land of Waes consist chiefly in the culture of flax and hemp; the other crops being in general for their own use, and for home consumption, which indeed is very considerable, on account of the great population of this district. The produce of their flax and hemp is so considerable, that in a good year they are reckoned to amount almost to the value of the ground.

The agriculture of the land of Waes, passes, without contestation, for the most complete and perfect in all the Netherlands.

Bamberg, August, 1795. A. MANN.

[THE NETHERLANDS.]

XXI. *Answers received from Bruxelles to the Agricultural Queries sent to* Abbé Mann, *relating to the General State of Husbandry in the Netherlands.*

QUERIES.

1. The Board of Agriculture is desirous of receiving a general view of the agriculture of the Netherlands, and a survey thereof, in the same manner as the printed Reports sent to Bruxelles.

2. It being understood, that some of the best husbandry in Flanders is about Ghent and Alost, it is particularly wished to ascertain what is reckoned there, the best rotation of crops for the different soils?

3. Also what are reckoned the best manures, and the best mode of managing them?

4. Next, whether the great crops of Flanders are not as much owing to excellence of management, as to richness of soils; and whether a Flemish husbandman could not raise good crops even on poor soils?

5. The cattle in Flanders, of all sorts, are kept in houses. Whether that is not reckoned an essential part of the Flemish husbandry; preventing the ground from being poached, saving the dung; and whether grass when cut, will not produce more than when pastured on?

6. Whether it is not reckoned of advantage to avoid having inclosures upon rich land, and what are the reasons assigned for such a practice in Flanders?

7. Particular information as to the culture of coleseed and clover, the basis of Flemish husbandry, would be desirable; also an account of their breeds of horses, cattle, and sheep.

8. Is the manuring with oil-cake practised, or is it always given to their cattle?

9. Which is reckoned the best system for the country, to have the farmers living in villages, or scattered up and down in separate houses?

10. What is reckoned the best size for farms, and the proper proportion of arable and pasture land? Copies are desired of what Abbé Mann has written on great farms.*

* Abbé Mann's Observations on this important subject, are to be found in the 4th Vol. of Memoirs of the Imperial Academy of Bruxelles, which may be seen in the library of the British Museum, of the Royal Society, the Society of Antiquaries, the Board of Longitude, &c. &c.

Answer to Query 1.

It is impossible to give general information respecting the agricultural state of the Netherlands, without submitting to sit down to write a certain number of volumes. The soil varies so much, that perhaps there is not a country in the world, the slender surface of the soil considered, that offers a greater variety; not only from one province to the other, but frequently even in one village from another: insomuch that it becomes absolutely impossible to satisfy the Board of Agriculture on this subject.

Answer to Query 2.

The Board of Agriculture has been misinformed, in regard to the environs of Ghent affording a good specimen of the most perfect husbandry of Flanders. The cantons of these provinces which are considered to be the best cultivated, are the *chatellenie* of Courtray, the *verge* of Menin, the *chatellenie* of Audenarde, the country of Alost, the country of Waes, both banks of the Dendre, and those of the Scheld below Antwerp.

The rotation of crops also varies infinitely on these different soils. One might nevertheless assert, that they have generally five crops in three years, viz. the first year coleseed; the second wheat, or rye, and one of carrots or turnips: the third year a crop of March seeds, besides carrots or turnips in some places. First, wheat or winter barley. Second, rye; and for two or three years following three crops of clover, or one of carrots or turnips, and one of March seeds afterwards.

The lightest and meagre lands, yield only one crop of winter barley or rye, then turnips or carrots, and the year following March seeds; so that these only afford three crops in two years.

The March seeds of these provinces consist particularly of summer barley, oats, flax, poppy, peas, vetches, lentils, horse-beans, buck-wheat, and spurrey. All these productions thrive perfectly well on the most meagre soils; spurrey in particular, is principally cultivated in the district termed the *Campine*, where the soil is in general meagre, sandy, and arid.

Answer to Query 3.

It is asked, *what is reckoned the best manure, and the best mode of managing the same?* It is answered: that intelligent farmers of these provinces neglect no kind of

manures; and make the most advantage of every sort they can get; however, the best sorts of manure may be generally reckoned to arise from the dung of horses, cows, and swine. Sheep's dung is scarcely known in the well cultivated districts, for want of proper pasture for them, and where, besides, land is too valuable to be employed in pasturage for sheep. Flocks are only seen on large farms, and where consequently land is less valuable.

The most valuable manure, but difficult to be had, is pigeons' dung, and that of poultry, wood ashes, and coal ashes; those of the bleachers of linen, nightmen's soil, and finally the dirt of the streets, particularly those of Bruxelles.

The good husbandman is careful that his manure should never become parched and dried up; by which means all the volatile salts would evaporate. He lays his dung, as often as possible, close to his stables and cow-houses, and sheltered from the sun. If this cannot be avoided, he contrives to lay it under some large tree, to partake of the shade of its boughs. As a receptacle for their dung, they generally dig a pit, five or six feet deep, with sufficient dimensions for the necessary deposit, from the month of March till harvest is over. The more opulent farmers are not satisfied with merely digging such a pit, they further pave and line it with bricks, that the earth should not absorb any of its parts; but that the thick matter should remain plunged in a mass of stale, increased further by rain. The stables and cow-houses, are paved and sloped in such a manner, as to communicate with a drain, which conveys all the stale of their cattle towards the dung pit, which by this contrivance it keeps constantly supplying.

It may be supposed, that in such a deposit, the decomposition of the fibrous parts of vegetables contained in the aforesaid litter, and in the dung of cattle, is effected with more facility, and a less evaporation of its nutritive salts, than by any other method. The good husbandman is so well convinced of the truth of this assertion, and preference to be given to this method, that he only employs four times the quantity of such manure, where he would employ five times the quantity of other manure, collected with less care and precaution, and where the above method is not observed.

Answer to Query 4.

It is a great error to imagine, that the soil of these provinces is naturally fertile. It is, on the contrary, of such a quality, as only to admit of fertilization in consequence of an infinite series of operations, more or less laborious and expensive. The

territorial soil of these provinces may be classed under four heads. The first and the most common consists of pure sand; the second is clay; the third is slimy earth; and the fourth is marly. The sand is generally tinged with a martial ochre, every where composed more or less of crystals, pure, rough, and sharp. The clay is seldom found pure; and is frequently mixed with fine sand, which lessens its tenacity.

The slimy soil is only found in hollow places, and at the bottoms of hills, corresponding with eminences, that are argillaceous and marly.

The fourth class comprehends marl; it is found in strata more or less extensive. The pure sandy soil, it is agreed, is not difficult to cultivate, but it requires a great deal of manure, and the crops got from it are not the most profitable.

The petty farmers who hold these light soils cultivate them with the spade, and dig the ground with as much care as the best cultivated gardens. Such soils are occasionally dug with the spade, two, and two and a half feet deep. By this means the soil of the surface, worn out by continual crops, gets some rest under that which is dug up, and causes a succession of fertility.

Such lands, as are too stiff and compact to be dug with the spade, are ploughed with great care, and in small furrows, that the clods of earth may be as small as possible; after the second ploughing, the clods are broken with wooden mallets. This is again repeated after the third ploughing, so that before the seed or grain is committed to the soil, it has been turned as much as in any garden.

The low and damp situations are brought into value, by means of trenches dug from distance to distance; and the earth dug out of them serves to raise the surface, while the trenches serve as drains to carry off the water.

It becomes necessary that these trenches should be constantly attended to, to prevent their being choked up: moreover, the mud taken out of them, the produce of rotten vegetables, contributes not a little to fertilize the soil. All these soils are dug with the spade about one foot deep. It seems then, from the above narrative, that in any country, every farmer who will take the same trouble, and put himself to the same expence, as the Flemish husbandman constantly does, will raise equally as good crops.

Answer to Query 5.

There are some farmers whose cattle are constantly within doors, but the number of such farmers is trifling, compared to those who turn out their cattle into the meadows, when they have any grazing ground for them.

As the allotments of land run generally small, in the well cultivated districts: it happens that many farmers are without any pasture ground, in what falls to their particular share. These are under the necessity of supplying the deficiency by other forage, as well of grass, as dry, according to the seasons; in summer they use green clover, and in autumn, winter, and spring, dry clover, straw of all sorts, potatoes, turnips, carrots, and after-grass, which they purchase of those who have meadow land. It may, therefore, be supposed, that cattle belonging to such kind of farmers seldom or ever leave the stable, unless the villages on which their lands depend, enjoy a right of commonage: in which case, some will turn them out on such common; while others prefer keeping them within doors, to avail themselves of their dung, which they would lose if they were grazing on the common. Therefore there is no general rule in this respect, and every one follows what he thinks suits him best. With respect to any apprehension of the ground being poached, the farmer, so far from having any such fears, maintains on the contrary, and with reason, that the more his land is trampled on by cattle, the more fertile it is; but this is not the case with regard to horses, when they are left to range at liberty in the meadows, unless they are unshod. The Flemings distinguish their meadow lands under two different descriptions, of *prez à faucher*, and *prez à paitre*; viz. "mowing meadows, and "pasture meadows." The pasture meadows serve to fatten oxen, which he purchases at market. The grass of these is fine and nutritious: on the contrary, the grass of the mowing meadows is not so fine, grows very high, which renders it more wholesome and abundant. This does not, however, prevent those who have mowing meadows from turning their cattle into them; but in the day-time only, after cutting the after-grass, till the season when it begins to snow, and that the hoar frosts oblige the farmer to bring them back into the stable. This may serve in answer to what is asked at the close of the 5th Query.

Answer to Query 6.

There are two reasons existing in Flanders, which engage the husbandman to inclose his meadows: the first is to prevent the wind from ravaging his corn, flax, hemp, and other products, that shoot up with a weak and fragile stem. These fears are the more real, as such vegetables grow very thick and close in this country, where they have a great deal of rain; therefore if they are once lodged, it seldom happens that they recover again. When such damages ensue, the loss is great to the farmer.

The lodged corn shoots, nevertheless, and the straw rots before the harvest season is come round. Flanders and all the other provinces suffer much more than other countries from the westerly and north-west blasts, which blow with impetuosity at times. The higher sorts of trees, as well as the coppice, prevent and stop in some degree the violent ravages which would follow from these tempests and storms that are very frequent, particularly towards the summer solstice.

The north, north-east, and easterly winds, are not less prejudicial in spring; these winds are of so parching and cutting a nature, that they seem not only to keep vegetation in suspense, but even to retrograde the vegetative juices; from whence the farmers name these winds *the devourers of herbage.* It is at the same time a fact, that the fields inclosed in this manner by such numbers of trees, coppice, &c. which at a distance give them the appearance of forests as it were, are certainly screened from the disasters arising from these blasts, in a manner surpassing those open and naked lands, which do not enjoy such protection. Another reason in favour of inclosures, particularly in these provinces, arises from the great want of fuel, the peasant having no other firing but wood, of which he wants a great deal. His cattle being the greatest part of the year under cover, he is in constant want of firing, for the food to be provided in autumn, winter, and spring. His chimney always smokes, and the caldron is ever on the fire: and were it not for such ample inclosures, exclusive of the shelter from winds, the price of firing would be excessive.

A third reason might be added, which is also proved by fact, that our harvests are never so copious, as when the land is cherished, and supported in a constant state of moisture: our soil, naturally sandy, does not preserve moisture, and if the great evaporation were not impeded by the shade and coolness of inclosures, it is evident the harvests would suffer. Every good farmer may perceive this every year, by comparing such crops on open grounds, with those on the inclosures above mentioned.

Answer to Query 7.

Notwithstanding that meadow land is common in general, in these provinces, the division of property in very small lots is such, that agriculture would suffer from the want of meadows, were it not made up by clover. They generally sow it on the rye in grass in spring; and after the crop of the latter, the young shoots of these plants appear amidst the stubble. These plants shoot out with such vigour, that towards the

end of autumn it may be mowed and given out as fodder to cattle. But this first crop is nothing compared to what this plant affords the two successive years.

Experience has taught us, that it is indispensably necessary to strew ashes over the clover every spring: the Dutch ashes are generally deemed the best for this purpose; if these cannot be procured, they then make use of coal-ashes, or peat-ashes, or the lees of wood-ashes.

These ashes are laid on in the broad-cast manner, the same as corn. A still, hazy morning is preferred for this operation, lest the wind should blow them away, and prevent their fixing on the soil and plants in the manner intended, if such calm mornings were not made use of. By this means they not only destroy insects which fasten on these plants at this time of the year, but serve also as manure for the soil. In effect, the change which these ashes cause on the clover is perceptible in the course of a week; and it is known from repeated experiments, that without this precaution vegetation has suffered so sensibly, that a crop of clover has been lost, and the others less plentiful. As for coleseed, though it is known to be very productive, and profitable when it succeeds, it is also understood to be very expensive, and the returns not always to be depended upon. The spring frosts and the hoar frosts, just at the moment that the flowers bud out, are very prejudicial. The winter frosts after rains are equally detrimental; but when the ground is well covered, the hardest frosts are of no consequence, and serve rather to strengthen the root, and produce more copious blossoms.

Such lands as are destined for coleseed, not only require considerable manure, but also a thorough dunging. It is equally necessary, that the ground should be cleared of every noxious plant whatsoever, and prepared with as much care as for a garden. The field should be divided into borders; the middle of which should be elevated, and the trenches which separate them ought to be very deep, that the water might run off and not damage the roots of the plants. The plants should be taken from a rich soil, in order to have them strong and vigorous, they must then be sorted, reserving the stoutest and best for plantations; the more ordinary ones serve as fodder for cattle.

The coleseed is planted in October, either in furrows or with the spade; those who only plant in furrows, do their business quicker than others who work with the spade. But these, on the other hand, are more sure of success, because the roots of plants by this precaution, are well secured under ground, while, according to the other

method, many languish or perish, from the roots being exposed, and want of covering.

The best time for planting coleseed is in damp rainy weather, that the plants may take root quickly.

When they are planted in furrows, the furrow is made seven or eight inches deep, with a plough drawn by one horse: women and children posted at different distances fix the plants in the furrows, at a foot asunder from each other; these become covered over at the return of the plough, when the next furrow is traced near them; and so on progressively till the whole field is planted.

When this operation is performed with the spade, five labourers place themselves in front on the border, when each makes a deep hole in the ground with his spade, thrusting his spade forcibly, and moving it backwards and forwards, to enlarge the aperture. This being done, a person who stands before, fixes the plant therein, and covers it over again with his foot. This is, doubtless, the most tedious way, but appears to be the most certain, as it seems to prevail more and more every day.

There are two breeds of horses in Flanders: the first is the original breed of the country, the other is foreign.

The Flanders horse of the primitive race is a large animal, whose frame is stout, with a broad fore-end: he has a large heavy head, a short thick neck, a full chest, a big belly, a round rump; the bones of his legs are thick and short, with an immense hoof. Such is the original Flemish horse; though his shape is not the most pleasing, it is nevertheless agreed on, that this structure is by far the most suitable for the husbandry of a country like Flanders. We have already observed, that the soil of this country is in general sandy, light, and deeply cultivated, consequently an elegant formed horse, with long and delicate limbs, a round hoof, and a thin shape, would be good for nothing. Experience has taught the husbandman, that the horse which is not square set, and whose legs are not stout and thick, with a strong broad hoof, is soon blown. A small round hoof would sink directly in the sand, and he would be in a violent sweat after he had gone a few steps, with the mere exertion of lifting up his feet out of the sand; whereas the large broad hoof of a Flemish horse, by covering so much more space, does not sink so readily, and his whole exertions tend towards his labour.

Besides this original horse, which is the most useful for our husbandry, we have various mixed breeds of different shapes and points, adapted for the peculiar soils of

such provinces as may vary from those of the country at large. The foreign breed of horses may likewise be divided into two sorts; these proceed from Friezland, Danish, and Neapolitan stallions, introduced into our studs, or in the possession of private individuals.

This introduction has produced two breeds of horses, for coaches, and general draft, both good, and serviceable in their kinds: we see them frequently in our town carriages. The Flanders mares are particularly valued. They have good wind, and last a long time.

The second sort is of a smaller size, and such as are used for dragoons. They seldom keep them beyond the first year, for want of pasturage; the dealers from Normandy then come, to buy them up, and carry them into the extensive pastures of their own country, where having left them to graze for two or three years, they bring them home for sale; when they are dispersed over Europe under the appellation of Norman horses. It is computed that they export annually from Flanders, from nine to ten thousand of these horses.

With respect to Sheep, as flocks are rather scarce in these provinces, little can be said concerning them. It is only known that on the borders of the Lys there is a breed of sheep, originally from the East Indies; they are of the largest size, and their wool is remarkably fine. They name them *Flandrins*.

The heaths known by the name of *Landes Campinoises* also serve as pasturage for numbers of sheep of a large size, but their wool is rather indifferent.

The sheep in the Duchy of Luxembourg are very small, but their wool is very fine, and in great request with the French.

The Flemings make no use of oxen in agricultural labour; for which reason all the calves are destined for the slaughter-house.

The ox that is to be fatted is imported from France, turned into the meadow, and returns again to France afterwards. This is a very profitable branch of traffic to the Flemish husbandmen, as they export in this manner, one year with another, at least 14,000 oxen, fatted in the pastures of Flanders.

Answer to Query 8.

I have never heard it said, that the coleseed cake was made use of as manure in Flanders. It is too expensive an article to be wasted for this purpose: they confine

themselves in dispensing it (and this without profusion) to their cattle, to which it serves as a wholesome and excellent fodder.

Answer to Query 9.

I have said above, that the divisions of land held by the Flemish farmers in the best cultivated districts are very small. I shall now further add, that the dwelling of each of these farmers is situated nearly in the centre of his domain; not but that in the villages, a number of houses stand in clusters round the parish church; but these houses are generally tenanted by the curate, the mayor, the clerk, the churchwardens, &c. besides innholders, farriers, wheelwrights, shoemakers, and other mechanics. But the true farmer is always careful that his dwelling house should be near to his farm, that he may be at hand to superintend the feeding of his cattle, &c. I may be asked, how a family will find means to support itself on the produce of a farm of such small extent? I shall give for answer, to those who are not in the secret, that the Flemish farmer is extraordinarily sober and parsimonious; that his industry not only finds him the means of support on his little spot of land, but further, affords him wherewithal to provide clothing for himself and his family. One, two, or three cows yield milk enough to have porridge on his table twice a day for his family, as well as butter and cheese sufficient for their use. His field gives him corn enough to make bread for his house, and to put into his soup. Further, potatoes and turnips, with a young pig or two, which he buys in the spring, and kills on the first of November. These are all the necessaries for food; and his flax clothes himself, and family.

Hitherto he has nothing to sell, and of course is without money; but therein consists the great secret of Flemish husbandry.

The Flemish husbandman is only a farmer in summer, that is to say, from the month of March till October. The good housewife, with all her family, employ themselves in combing and spinning their flax, from seven in the morning till eight or nine o'clock at night. Meantime the husbandman weaves his flax, and carries it to market, as soon as a piece is finished. Those who do not know how to weave, sell their flax in its crude state, and also the thread which the family have spun during winter, while they employ their time in some other lucrative art.

It appears then from hence, that the prosperity of the Flemish husbandman does not arise solely from his talent in agricultural pursuits, but likewise from his sobriety

and the economical habits of his family, which not only spends nothing during winter, but on the contrary is making a profit: while every where else, the summer is barely sufficient to maintain the petty farmer during the idle months of the winter season.

It is to the great industry, therefore, of the Flemish farmer, that we must look up to trace his prosperity: it is to the same cause that we must attribute the striking example, that a small surface of land suffices to support an immense population. And if these truths are attended to, I shall be excused from particularizing the reasons for the division of land, into small farms, being preferable to the extending them into large portions. Experience, moreover, has evinced, that the farmer, dwelling in the centre of his farm, is better enabled to superintend it, night and day, than when he lives in a village, and of course more or less removed from the principal objects of his care and pursuits.

Answer to Query 10.

The answer to the first part of this Query, viz. *what is reckoned the best size of farms?* will be found answered in what has been offered in the preceding article. With regard to ascertaining and answering the further query, of *the proper proportion of arable and pasture land?* this must depend on an infinite number of accessory circumstances. In the first place, to cultivate land with any success, there must be manure. To have manure necessary for the country of Flanders, there must be cattle. Finally, when you have cattle, you must have wherewithal to feed them. It becomes necessary then, that a farmer should have as much pasture land as will answer his wants for manure. This truth is most evident, as well as the other, proved from the experience of Flanders, that it is a matter of indifference, whether the cattle which yield manure are maintained by vegetables, the product of the meadows, or of ploughed land; for it is an incontestable fact, that a great part of the Flemish farmers till their lands, without the advantage of possessing a foot of meadow. But it is not less true, that natural or artificial pastures should be exactly proportioned to arable land. I speak of Flanders, where the practice is unknown of chalking and marling their lands.

[THE NETHERLANDS.]

XXII. *The Answers of Baron de* Poederlé *of Bruxelles, Chamberlain to his Majesty the Emperor and King, to the Queries sent in a Note addressed to the* Abbé Mann *by Sir* John Sinclair, *Bart. President of the Board of Agriculture, &c.*

Query 1. *The Board of Agriculture is desirous of receiving a general view of the agriculture of the Netherlands, and a survey thereof, in the same manner as the printed Reports sent to Bruxelles.*

Answer. In compliance with the wishes of the Board of Agriculture, of receiving a general Report of the state of our husbandry; it would be necessary to acquire information almost in every village: in as much as the great variety of situation, soil, &c. occasions great difference in many respects: such inquiries, therefore, would require infinite time, and would nevertheless be imperfect, from the numberless impediments that would occur. It seems to me, therefore, in a manner impossible to satisfy completely the wishes of the Board, at least for the present.

Q. 2. *It being understood, that some of the best husbandry in Flanders is about Ghent and Alost, it is particularly wished to ascertain what is reckoned there the best rotation of crops for the different soils?*

Ans. Without asserting the environs of Ghent and Alost to be the only places where cultivation is in its highest perfection, it may be added, that the province of Flanders contains the most districts where this perfection is to be observed, more or less: for instance, in that part named *Pays de Termonde* and *Pays de Waes*; though the soil is in general sandy, it is nevertheless very productive, which may be attributed to the great population, number of villages, the goodness of its natural meadows, which are very fertile, and serve for numerous herds of cattle, affording an ample supply of manure, which the farmers, however, do not depend upon exclusively, availing themselves of what they receive by water-carriage from Holland, or from other towns in their own country, situated near rivers or canals, by which resources the land receives great melioration. There are some villages in the neighbourhood of Termonde, where it is the custom to manure a *bonier* of land once in

seven years only, with forty or fifty cart loads of dung; which land is then sowed thus: the first year hemp; second flax; third wheat; fourth and fifth rye; sixth oats; seventh clover, buck-wheat, turnips, and carrots. They also cultivate spurrey, which is sowed about the middle of August, on lands that have borne wheat, and to which they give a slight ploughing; and in October they graze cows there. When they wish for a seed crop, they sow in March, and reap in May or June.

The lands are cultivated with a hoe, a spade, or a small plough, the construction of which is very simple, only one horse and without a breast-board (*touze*). The richness of the soil consists in their harvests of hemp and flax, the other crops being chiefly for domestic use and family consumption. The sale of these two plants is considerable, as they succeed perfectly, and yield to the farmer the full value of the fee simple of his land.

In other parts of the province of Flanders, in the vicinity of Ghent, for example, the greatest farm contains about sixty *mesures* of land: each *mesure* consisting of 300 *verges*. The farmer has only three or four horses, and ten cows, including calves. He employs twenty-five carts, each cart having two horses to manure three *mesures* of land; but only fifteen or sixteen carts when he is supplied with mud and ashes from Ostend, by the canals.

The lands are sowed with white-wheat, flax, rye, oats, and clover: and are manured in spring with turf-ashes, at the rate of sixty bags of ashes for three *mesures* of clover per ann. Spurrey is sown on grounds where they had a crop of flax: and the husbandman who has a farm of sixty *mesures* employs seven *mesures* for turnips, with which he feeds his cattle in winter, and till the season becomes more favourable.

The plough employed in all these parts is *à versoir inamovible* (immoveable breast-board), one small wheel, and only one horse, unless the nature of the soil should absolutely require more.

In general all these methods of cultivation vary according to situation and the quality of the soil.

The following may further serve as another instance. Between the cities of Ghent and Bruges, on the right hand side of the canal which leads to the latter city, the soil is chiefly sandy. The farms are in general large, and divided into *mesures* of 300 square *verges* each; the *verge* being fifteen Flemish feet in length. The partitions are made in this manner: one measure of land is manured the first year with a boat-load of dung or filth from Bruges. They then sow flax; the second year wheat;

the third rye; the fourth, after being slightly manured, oats, buck-wheat or clover; turnips, red or white carrots, or potatoes.

These plants supply the want of natural meadows, for which reason they are the more cautious to preserve them in winter to feed their cattle. For this purpose they are piled up in a conic form, the base of which is about ten feet diameter, and five or six feet high. When the carrots are thus piled, they spread long straw over them, which is next covered with a coat of earth; a small trench is then dug around the whole, to facilitate the running off of water; and in proportion as the plants are wanted to feed their horses and oxen, and in spring their lambkins, they make an opening in the pile to supply their wants. As for potatoes, they preserve them in deep pits.

Clover is sown with oats; it lasts but one year; the field which produced it remains one or two years in grass; it is then ploughed, manured, and sowed with flax or wheat. They plant broom on lands they want to improve; they root them up at the end of two years, at the beginning, or during winter, and in March it is ploughed to bring it into tilth.

Here and there one meets heaths, which are cultivated from time to time, and also coppices of birch trees and alders, but principally oaks; and in other places the *pinus maritimus*. They also plant numbers of sallow-trees, which are left to grow up to their full state, when they sell better than oak, from the great demand for them to make capstans for sloops and bilanders.

To give the Board of Agriculture an idea of the great variety which reigns in the Belgic husbandry, I shall give some further instances respecting different farms in Brabant, the Campine situated on the northern parts of that province, and in the province of Hainault.

A farmer of the Campine, whose farm may be about twenty *boniers*, keeps two or three horses, seven or eight cows, and a few oxen, and raises coleseed, rye, oats, clover, little or no wheat, potatoes, carrots, and turnips. Spurrey is particularly cultivated in this district to the north of Brabant. It serves to feed the cows in autumn, and the butter made with their milk at that season is known by the name of spurrey butter. It is to be observed, that the Campine district carries on a considerable traffic in butter, and furnishes a large quantity yearly, particularly from Bruxelles, where it is chiefly used for the kitchen, being more profitable in a system of economy than any other sort of butter. The spurrey is sown on those lands that have bore wheat, to which a

slight ploughing is previously given. The cows are put in to graze there in October; each is fastened to a stake, allowing such a proportion of ground as is deemed requisite for its support. This mode of grazing lasts till the frosty weather sets in.

As straw is rather scarce, and without it little manure can be obtained, this want is supplied by cutting turf on the heaths, which is conveyed to the stables and cow-houses, to serve as litter for horses and cattle; as the foundation has a depth given to it for the purpose, the bulk increases daily, and forms so many layers, impregnated with saline particles from the dung and stale of the animals kept there. This produces a kind of earth of an excellent quality, tending greatly to fertilize arable land; for which reason, these receptacles are cleaned very carefully from time to time, and the manure removed and piled up in heaps till the proper time comes to convey them to the parts where they may be wanted. It may be presumed from the above, that the cattle are constantly confined in the stable. The reason is plausible, and answers in part to the article, No. 5, of the Board of Agriculture.

The following is the mode of cultivation generally practised at present in many parts of Brabant. I take, for instance, a farm consisting of forty-two *boniers*, of which six are natural meadows, four artificial meadows, and thirty-two arable land: these thirty-two *boniers* are manured every year (for no part rémains fallow) with sixteen, or sometimes only twelve, cart loads per *bonier*, those excepted which bear clover, on which, in March, they lay turf-ashes, which are got by the canals from Holland. They employ frequently from eighty to one hundred casks per *bonier*, reserving one half, or a third, to throw on after the first crop. Many farmers set a high value on these ashes, which fertilize their lands to such a degree, that they can have a wheat crop without any other manure or process, than what is customary after a crop of clover. The distribution for such a district is thus:

From six to seven *boniers* coleseed; six to seven, wheat; four to five, rye; three to four, meteil, or *orge quarré* (square barley).

With respect to March seeds, they employ four *boniers* for oats; two for horse-beans, peas, and vetches; four for turnips. The *boniers* intended for coleseed or wheat should be manured: then the first year coleseed; second, wheat; third, without manure, rye.

It requires two *raziers* and three-quarters of wheat for a *bonier*, each *razier* weighing about 80 lbs. weight; and when the crop is good, it will produce thirty *raziers* of the same weight.

There are farmers who strew turf-ashes on their turnip fields, over which they pass the harrow. This will answer in part, the third article of the Board's inquiries. Those who keep flocks of sheep feed them in winter with corn, peas, and vetches, having no land in fallow.

Another excellent method for manure practised by many farmers is as follows: when they have open fosses near their farms, they deepen them so, as to contain twenty tons, wherein the stale of cattle may be carried off by a sink made on purpose; by which means they can manure two or three *boniers*, by watering them with this stale. This is a manure very desirable, and comes daily more into practice. This will answer the third article of the Queries of the Board.

Q. 3. *Also what are reckoned the best manures, and the best mode of managing them?*

Ans. The Board will have perceived, that turf-ashes and stale of cattle are both held in high estimation as excellent manures. I shall further add, to what I have already mentioned, in further answer to the third article of the aforesaid note, that cow dung as well as horse dung, forms the basis of our manure, and the more it is putrid, the more valuable it becomes. These are the chief manures in farms; there are others, such as sheep's dung, pigeons' dung, human soil, the mud of the streets; all which are likewise used in many places according as they are more or less proper for the nature of the soil, or that they can be had. With respect to the question, what are the best methods of employing the above to the greatest advantage? they vary very much, and it would require great details to make a satisfactory report on the subject.

Q. 4. *Next, whether the great crops of Flanders are not as much owing to excellence of management, as to richness of soils; and whether a Flemish husbandman could not raise good crops even on poor soils?*

Ans. It is certain we may in part attribute our great crops in Flanders to the richness of the soil, its moisture, and depth; but if we were to look back, it would be found, that this has not always been the case, and that much may be attributed to the variety of manures: Therefore it is probable the Flemish husbandman might obtain nearly the same crops by the same methods on lands deemed barren; I say deemed, because some are only so in appearance, and others in reality. In this manner, I have been assured by farmers, that, there are lands the nature of which was such, that they could only get half a crop, if they aimed at having a

crop every year; but if they left them one year fallow, they then had a full and good crop.

Q. 5. *The cattle in Flanders, of all sorts, are kept in houses. Whether that is not reckoned an essential part of the Flemish husbandry; preventing the ground from being poached, saving the dung; and whether grass when cut, will not produce more than when pastured on?*

Ans. It is presumed, that in those parts of the province of Flanders where it is the custom to keep cattle in the stable, it is more for want of meadows and pasture out-doors, than otherwise, the farms being so confined, and the property of each individual restricted to a few *mesures* or *boniers* of land, under which circumstances cattle of all kinds go abroad very little, and are in a manner confined within doors through necessity, and fed by means of what is obtained from artificial meadows. Thus the petty farmer may acquire a stock of manure in good condition for his purpose, which he could not otherwise obtain without the aid of a stercorary, such as I have described in my answer to the second Query. I am, therefore, of opinion, that it is only for the reason abovementioned, that this custom may be considered as an essential point in this cultivation, since it enables the farmer to avail himself of the whole of the dung when the farms run small. The reverse of this method prevailing in other provinces, is in support of my conjecture, in as much as the farms in those places are larger, and the cattle turned into the meadows, or orchards, at six, seven, or eight o'clock in the morning, from whence they return at eleven into the stable; there they find clover, and often turnips, in October. The dairy-maids then milk the cows, and at two o'clock they are conducted back to the meadows till seven, during summer, when they are brought home again. While the cattle are grazing in the morning, the women servants clean out the stables, and carry the dung to a pit in the centre of the farm-yard, where it putrefies, and remains till the proper time of using it as a manure where required. In those places where they make hay, the cattle is kept here and there, within doors; but in farms where they have meadows for grazing, or orchards, the cattle are turned into them as abovementioned; consequently we may conclude, that these different methods, which vary in an infinite degree, depend more or less on local situation, and may be proper in one place, and not in another.

Q. 6. *Whether it is not reckoned of advantage to avoid having inclosures upon rich land, and what are the reasons assigned for such a practice in Flanders?*

Ans. In some parts of Flanders and of Brabant, where the soil is light and sandy,

the farms small, property much divided, and the proprietor not having more than one, two, or three horses, the fields are small, and inclosed with quickset hedges; the wind cannot then so easily sweep away the surface of these light soils, as inclosures serve to screen them from their pernicious effects, particularly in the spring season; nor can the rays of the sun in very hot summers parch and scorch the land, and destroy its products. These hedges form, moreover, a kind of coppice, which is cut every five or six years for fagots, which constitute a considerable branch of traffic in some districts, and are the more in request for fuel, in those parts where wood is scarce.

Such inclosures, on the other hand, are not customary in those parts where the lands are of a cold, humid, and compact nature, &c. where a free circulation of air is requisite. This is so evident, that they always destroy the thick strong hedges which surround such fields, from the nature of their soil being different from the light and dry soils abovementioned; consequently inclosures would be prejudicial to such cold soils, while they are of great use to the others.

Q. 7. *Particular information as to the culture of coleseed and clover, the basis of Flemish husbandry, would be desirable; also an account of their breeds of horses, cattle, and sheep?*

Ans. The coleseed is sowed about the middle of July, when the weather is warm and dry. The fly destroys it as it grows up; this havock is not uncommon, as also at the time of its being in flower. When the period is proper for transplanting, this operation generally takes place towards the end of September, and is performed by the spade, by the instrument named *plantoir*, or with the plough. This last method is the least proper, and of course the least in use, because by this mode the plants are not so deeply fixed in the ground; whereas by the other methods the holes may, and ought to be, five or six inches deep. The spade has this form , and the plantoir this . A labourer makes the holes in the ground, moving backwards, and little boys or girls, following him in front, fix a plant in each hole, and cover over the root with their feet. If this plantation is performed with a plough, the plants are arranged in the furrows of the plough, which at its return throws the earth over it by means of the *versoir*. Some time after, the farmers cherish, and cover the feet of the plants with the common spade, and with the earth dug from the furrows, the coleseed being planted in ploughed land. This forms a kind of nurture for the plants

during winter, by the crumbling of the earth. The crop is in June, if the weather permits, or the season is more or less forward. When the plant is cut, it is left on the ground, where, in about ten or twelve days after, it is thrashed on a linen cloth spread on the ground for that purpose. The seed is gathered and put into bags and carried home. When they have a good crop, one *bonier* of land will produce forty *raziers*, of 80 lbs. weight each. Observe, that the field intended for coleseed should be dunged the same year, and have two ploughings. This short detail seems sufficient in reply to the seventh Query of the Board of Agriculture.

With regard to their Queries concerning the cultivation of clover, it consists in sowing it in the sowing season of wheat and rye. In some places it is sowed with the March rye or the summer barley; some even sow it with flax. When they propose to collect the clover seed, which is an object of great trade in these provinces, they should take that of the second crop, after having had the first crop before the feast of St. John the Baptist, for the first flowers do not give good seed; and the better to make sure of this crop, they gather by the hand the round *capsulæ* containing the seed, in proportion as it ripens; and after their being thoroughly dry, they are thrashed till all the seed falls out. Of all the different methods of collecting the clover seed this is reckoned to be by far the safest and the best, by all good judges.

An artificial meadow of clover lasts two or three years; 20 lbs. of seed, a little more or less will do for a *bonier*, the dimensions of which vary in different places, as I have already observed in the course of my Answers to these Queries. Some farmers, when the lands are cold and stiff, strew turf-ashes in the spring of the second year over these clover grounds, in the proportion of forty small tubs of ashes per *bonier*, each tub weighing about 6 lbs.

Respecting the breed of horses, it varies according to the districts, size of the farms, quality of the soil, or trade of the particular place; in general they prefer having them strong. In some parts of Flanders, Brabant, Hainault, and the territory of Namur, they have a breed of coach-horses. The larger and lesser breed of cattle vary in the same manner, according to the more or less nutritious juices of the soil, in the natural or artificial meadows, which have an apparent influence on the size as well as quality of the flesh of the animal, and the goodness of the milk of the cows.

The flocks of sheep are considerably diminished within these thirty years; insomuch, that there does not remain above one in ten. The reason is supposed to be

from the numerous inclosures, the few fallows, and the great population. Moreover, the price of wool itself, as well as of the sheep, is double the sum.

It must be observed, that the best wool is found on the flocks between Bruxelles, Tournay, and Lille, on an average of five leagues each way on these roads; this is attributed to climate, and the quality of pasture. This wool is called *the finest* (or *the flower*) *of all the wool of Belgium*. That beyond Mons, the environs of Nivelle, Louvain, Jodogne, Tirlemont, &c. is coarse and short, and the price is one-third less. We likewise have flocks of intermediate breeds spread over the provinces, which vary frequently from village to village. The wool of the Ardenne sheep is fine, short, but of a slender produce, since three fleeces of these will not weigh more than one fleece of those mentioned above, between Bruxelles and Lille, &c. The sheep of Luxemburg is also of the smallest size.*

Q. 8. *Is the manuring with oil-cake practised, or is it always given to their cattle?*

Ans. I cannot positively inform the Board whether oil-cake is made use of as manure; but I have no doubts respecting the giving of it to cattle.

Q. 9. *Which is reckoned the best system for the country, to have the farmers living in villages, or scattered up and down in separate houses?*

Ans. It seems in the province of Flanders, at least in the populous villages, the farmers incline to prefer dwelling in villages, and reunited, since custom has long ago established this method; whereas in other provinces, more particularly Brabant, Hainault, Namur, &c. the farmers properly so called, live for the most part dispersed in the country, where the principal farm is generally situated.

Q. 10. *What is reckoned the best size for farms, and the proper proportion of arable and pasture land? Copies are desired of what Abbé Mann has written on great farms.*

Ans. It is scarcely possible to determine positively what size is most preferable for farms, in as much as this varies in each province, and even in the different parts of the same province. In the country of Waes, which comprehends an extensive tract of Flanders, the major part of the farms consist only of six or seven *boniers*, and many only of three or four. In fine, in the province of Flanders the greatest farm has little more than forty *boniers*. In Brabant their size may generally be computed (Walloon

* It is worthy of notice, that the species which forms the essence of these flocks, is the Flanders sheep termed *Flandrin*, the species of which, is the largest in Europe, and first brought from the East Indies to Holland in the 17th century.

Brabant excepted) from ten to fifty *boniers*. The increase of population since the peace of 1749, has greatly diminished the size of farms, as well in Hainault as elsewhere. The proprietors, in dividing their estates have almost doubled their value in money, and Brabant had no occasion for ordinances to this effect. But although in Hainault the increase of population and of buildings, with the reduction of farms, took its course from one place to another, beginning in the districts bordering on Flanders and Brabant, the States of the province petitioned the sovereign to settle the size of farms at seventy *boniers*.

In answer, however, to the Query of the Board, where it is asked, *What is reckoned the best size for farms, and the proper proportion of arable and pasture land?*

I shall give the arrangement of a farm of seventy *boniers* in Hainault.

Ten *boniers*, natural meadows; ten, wheat; twelve, rye; three, soucrion, or square barley; one, barley; eight, oats; four, beans, peas, vetches, or potatoes; eight, clover; fourteen, fallow.

The farmer who holds such a farm, dungs from twelve to thirteen *boniers* each year; and the second year he again sows corn on the lands thus manured. In this manner he has every year from twenty-six to twenty-seven *boniers* sowed with corn, or according to the language of our cultivators, *hard grain*. And when he plants four *boniers* with colzat or coleseed, he contrives to do it on the out stubbles of the oats.

If such a farm is *en masse*, or contiguous, the farmer may do all his work with eight horses, and maintain sixteen cows, twelve oxen, and a flock of two hundred sheep.

I shall be rewarded for this little memoir, if the British Board of Agriculture deems these Answers in any degree satisfactory to the Queries contained in the note sent by the Board to Abbé Mann.

Copied from the Original of the Baron de Poederlé,
in Jan. 1794. L. A. M.

[THE NETHERLANDS.]

XXIII. *Observations relating to the Rabbits of Angora, and the best Mode of Feeding them. Translated from a French Paper presented to Sir* John Sinclair, *Bart. by Monsieur* Bertrand *of Mechlin, in the Netherlands.**

THE rabbits of the Angora breed, yield in Normandy a wool which serves as a primary material in several considerable manufactures. The Normans assert that each rabbit yields wool, of the value of a crown of six livres. As this wool admits of being worked up with other wool, and different materials, it seemed to me to be an object worth inquiring into more particularly, whether some economical food might not be discovered for these animals, and which at the same time, would serve for a great number of them.

* Mr. Bertrand having made an excursion to London, transmitted the following observations, as having occurred to him in the course of his journey.

" I observed on my journey from Dover to London, that the plantations of trees were susceptible of great melioration. In the vicinity of Mechlin the trees are selected with more judgment, planted with more care, and lopped more judiciously.

" I noticed in the environs of Canterbury, that they did not cut the grass which the cattle had left; whereas with us, it is notorious, that such pasturage as has been slighted by one species of cattle has been devoured greedily by another; for which reason, our agriculturists turn in a succession of different cattle into the meadows, or else they make hay with the remainder, when this alternative does not take place.

" I observed that the cultivation of hops about Canterbury differs from our method. I presume it might be expedient to make an experiment according to our mode, to try whether the Flemish method might be more advantageous than the English manner of cultivating that plant.

" I observed that the wastes about London were susceptible of cultivation, or at least some degree of melioration, since the soil is better than our arid land, which has been brought into cultivation with great success in the Low Countries.

" I took notice of the potatoes sold in London; but I have not found those good species, or the varieties cultivated in Flanders. Amongst others, I have not seen that sort which our agriculturists name *soupe patate*, which is very productive, and when boiled in soup crumbles into flour. Neither have I found that sort named by us *prolifere*.

For this purpose I made a sacrifice of the trees and plants in my garden, and permitted these rabbits, and others of the common sort, to range therein at liberty. I observed, that the first day they ran from tree to tree, and from plant to plant; but the second day, they rejected the food they had selected the first day; and on the third day they quitted the vegetables they had fed upon the two first days. At the expiration of eight days, I distinctly perceived that they seemed to delight in the leaves of the *Robinia pseudo acacia* (the false acacia). I then confined them, in order to feed them entirely on those leaves: they not only continued to devour them ravenously, but also ate the bark on the branches of the tree. Satisfied with this discovery, I resolved to feed some females with these leaves solely, while to others I gave cabbage leaves, and the common food furnished to these animals. I observed that the young ones proceeding from the females fed on the leaves of the *Robinia*, grew larger, and in less time, and that their coats and wool were finer than on the others fed in the common way. I caused the skins of the indigenous rabbits fed with the *Robinia* leaves to be examined by hatters, and they valued them much more than the common ones, asserting that their wool approached in quality to that of hares.

This discovery becomes interesting for several reasons, and nominally for the following ones:

" I am desirous of communicating to the Board of Agriculture the different sorts of potatoes cultivated in Flanders and parts adjacent, which are the most esteemed.

" I have already been in the shops of the seedsmen, to inform myself whether they cultivated the same plants for forage in this country, as we do. I was surprised to find scarcely any vetches, which are cultivated with such great success in some districts of the Netherlands, and in the territory of Liege. I was surprised not to find the rich winter vetch, which is a great resource for sheep and horses. I shall be ready to make known these species of vetches, and to give information relative to their culture, if the Board pleases to accept of it: and if they are not known in other parts of the British dominions, I shall add all the species of vetches cultivated in the Netherlands, and districts contiguous, the culture of which has been attended to on a large scale. I found in the neighbourhood of Bruxelles a sort growing in a sandy ungrateful soil, which seems to merit attention, in as much as it bears its flower and seed at the same time, does not require a rich soil, and makes very good forage.

" I have frequently inquired whether the harrow we call *herse feniculaire*, discovered a few years ago, was made use of in England. I found nobody that knew it. If it should be unknown to the Board, I am ready to furnish a description of it, as well as the method of using it. It possesses the essential quality of rendering the grass turned by it, sooner into hay, of a better quality, and at a less expence. This harrow, in my opinion, is indispensably necessary in rainy seasons."

1st. That the *Robinia* thrives in barren and uncultivated districts, on heaths, of which I have a certain proof, on an acre of land I purchased near Maestricht, where the *Robinia* thrives remarkably.

2d. Because when the branches of the *Robinia* aré pruned, it grows better, becomes thicker, and resists better against the wind.

3d. Because the branches and leaves of the *Robinia* are remarkably numerous.

4th. Because the leaves may be converted into hay, which rabbits and other animals devour most eagerly.

5th. Because the growth of the *Robinia* is of longer duration than the major part of other trees.

6th. Because one person is able to cut a sufficient quantity of branches thereof for a great number of rabbits, or hares.

7th. Because rabbits may be looked after by children.

8th. Because, on establishing a mode of rearing rabbits after the method I should point out, a number of hands would be employed, and the primary materials of various manufactures would be augmented, as well as an increase of excellent manure.

9th. The discovery becomes the more essential, as it lays down principles, from which we may discover the most beneficial food for cattle.

10th. Because under the *Robinia* we may sow turnips, vetches, beans, and other vegetables proper to feed cattle.

[GERMANY.]

XXIV. *Mr.* G. G. Marwedel *on the Heath Flocks of Sheep, that graze on the Wastes of the Duchy of Lunenburg, and Margraviate of Brandenburg.*

THIS species is seldom met with, except in certain plains of the Duchy of Lunenburg, and of the Margraviate of Brandenburg, where there are extensive wastes and heaths.

They differ from the other sorts styled *noble*, as well in shape as size, and in the quality and goodness of the fleece. The sheep now under consideration are smaller than the others, their fleece inclines more to the quality of goats' hair, than wool, and its colour is generally brown or black, seldom white. Their ordinary food at all seasons is ling or heath, which they find in their pasturage.

As they are seldom kept in a house, they are obliged to seek their food abroad in all weathers, while sheep of other sorts are fed within doors, during the severe and cold seasons.

—— " Stabulis edico in mollibus herbam
" Carpere oves, dum mox frondosa reducitur æstas :
" Et multâ duram stipulâ filicumque maniplis
" Sternere subter humum : glacies ne frigida lædat
" Molle pecus, scabiemque ferat, turpesque podagras." VIRGIL. GEO. LIB. III.

Respecting the other distinctive characters of the heath flocks, I shall describe them by answering separately the Queries proposed to me.

Query 1. *Is the breed, so far as it can be ascertained, a native, or a foreign species? is it wild or domesticated? hardy or delicate?*

Answer. The species is absolutely genuine, and originally belonging to the country, in a pure state, without any foreign mixture. I have coupled ewes with foreign rams of a better quality, but the result has shewn, that the breed from a foreign stock has degenerated after the third generation into the common sort. The ewes, it is true, with such foreign rams, had lambs of a cross breed, but they did not take kindly to the climate, not finding pasture suited to their texture, on our heaths, where the ground is swampy, and the climate severe.

This species is quite domesticated, neither wild, or inclinable to stray. Their constitution being hardy, they are far from being affected either by the nature of pasturage, or pinching cold. Yet, notwithstanding this aptitude to endure by day the piercing cold of the season, when the ground is covered for several months with snow, the chilling north winds in winter, or the heat of the dog-days, they cannot, without apparent danger, be folded in the open fields during the night; the cold and damp soil of our heath will not admit of it.

Of all sorts of sheep, there are none so easy to provide food for as these, since they have nothing but what they find in the open air on the grounds where they pasture.

Q. 2. *Is this breed understood to be pure, or has it been crossed with other breeds? In what respect does it differ from other sheep, as to size, shape, or other circumstances?*

Ans. In general, the sheep in question are of a pure breed. Several attempts have been made to mend the breed, by a cross with a foreign ram and the ewes of the country; but the success has not answered equal to the pains taken.

The difference between this breed and others, consists in the following particulars:

1st. They are in general horned.

2d. The tail is shorter, and most commonly very small.

Length of a ram from the chest to the tail.					height from the foot to the spinal bone.	
A ram	$1\frac{1}{2}$ feet	42 lines	-	-	1 foot	60 lines.
A wether -	$1\frac{1}{2}$	42	-	-	1	60
An ewe -	$1\frac{1}{2}$	20	-	-	1	40
A yearling lamb	1	50	-	-	1	50 French measure.*

3d. The ewes are never milked, as they afford so little, that often two ewes together do not yield enough to suckle one lamb.

4th. The fleece is generally grey, brown, or black, and very seldom white.

5th. The fleece is neither tufty nor in curls, but smooth like goats' hair, except in lambs just dropped, which is frizly till the first time of shearing.

Q. 3. *What is the average weight of the carcass, and of the different quarters; and what the number of ribs?*

Ans. These are as follows:

* One foot in our country contains 129 lines, French; a French foot 144; an English foot $155\frac{1}{6}$. Our foot has 12 inches of $10\frac{3}{4}$ lines, French; an inch of France 12; an English inch $11\frac{1}{3}$.

1st. A wether, without the head and entrails, from 25 to 50 lbs.

2d. A ewe that has never lambed, or had a tup, from 22 to 24 lbs.

3d. A ewe of 7 or 8 years old, past the period of having lambs, from 15 to 16 lbs.

The head weighs 2 lbs.

The lambs are not killed for culinary purposes, on account of their smallness, therefore it is needless to specify their weight.

In weighing wethers and ewes with their fleece and intestines, it has been found that a wether, and such sheep as had never been put to a ram, well fed on the commons, weighed from 60 to 70 lbs. A ewe that had lambed, and suckled her lamb in the course of the year, weighed from 40 to 50 lbs.

The wether is generally cut up into four parts; the hind quarter weighs from 8 to 10 lbs.; the fore quarter from 4 to 6 lbs.

These animals have thirteen ribs on each side.

Q. 4. *Is the mutton remarkable for its goodness, flavour, taste, or delicacy?*

Ans. The flesh of a wether, or a ewe, well fed on the common, or fatted within doors, is more delicate and savoury than that of any other sort of mutton. It is more tender, less rank, and in taste resembles that of a tame chevreuil. The smoked hams of such mutton, well fatted, are delicious.

Q. 5. *What is commonly the weight of the fleece?*

Ans. (A.) Winter.

1. Of a ram - 2 to 3 lbs. (French)
2. Of a wether - 2 to $2\frac{1}{2}$
3. Of a ewe - 1 to $1\frac{1}{2}$ lbs.
4. Of a yearling lamb $0\frac{1}{2}$ to $0\frac{3}{4}$

(B.) Summer.

1. Of a ram not closely shorn in summer, not to lessen his vigour when put to the ewes in autumn - $\frac{1}{3}$ to $\frac{1}{2}$ lb. (French)
2. Of a wether - - $\frac{1}{2}$ to $\frac{3}{4}$
3. Of a ewe - - $\frac{1}{3}$ to $\frac{1}{2}$
4. Of a lamb of the preceding spring $\frac{1}{2}$ to $\frac{3}{4}$

The price of the fleece is determined by the answer to the following Query.

Q. *What is the quality, the length, the colour, and the price of the wool? and for what kind of manufacture is it best adapted?*

Ans. The wool of these sheep resembles more goats' hair, than the wool of any good breed of sheep. It is hard and coarse, and scarcely ever observed to be soft or fine. At the first sheering the wool of the lambs is softer and finer than the succes-

sive shearings, or the wool of ewes. Its colour, as beforementioned, is grey, brown, or black, seldom white.

The length of the wool, measured on the top of the back, is,

1. Of a ram 8 to 9 inches.
2. Of a wether 6 to 8
3. Of a ewe - 6 to 7 inches.
4. Of a yearling lamb 4 to 5

The winter wool being harder, coarser, heavier, and less fine, than summer wool, which is softer, finer, and lighter, according to the preceding Answer given; the white wool, and above all the summer wool, is dearer than the coloured wool, and is valuable in the same degree as the wool of lambs.

The common price of the fleece is,

1. For 10 lbs. of winter grey, brown, or black wool 3 to 4 livres (French.)
2. 10 lbs. of winter white ditto 6 to 7
3. 10 lbs. of summer grey, brown, or black ditto 6 to 7
4. 10 lbs. of summer white ditto 8 to 10
5. 10 lbs. of lamb's wool. 8 to 10

The weight of 10 lbs. in the purchase and sale of wool, is called *stein* (a stone).

The owners of flocks do not sort their wool in any other way, than by separating the white from the grey, brown, or black, before they sell it. But the wool dealers have their method of sorting it, separating the white from the coloured, and the fine and soft, from the harsh and coarse.

The sheep skins not sheared are rarely saleable, as our curriers can do nothing with them. But for the bare skins, without the fleece, the curriers and tanners buy them at the rate of, from 28 to 30 livres (French) the hundred.

When the ewes are too young or feeble to have milk sufficient, the lambs are taken from them, a few days after they are dropped. These latter are killed and skinned, and the skins are sold in the state they are in, at the rate of, from 32 to 36 livres Tournois the hundred, to the skinners; who having dressed them, they are made use of as furs.

The sheep's trotters, which our papermakers use, to make paste for paper, are sold at the rate of sixty, for four *sous*.

By the use made of the wool, a judgment may be formed what purpose it is best suited to.

The wool of the lambs is sorted with the finest summer wool of the ewes, white and grey, and is made up into hats in our country. Of the winter grey and white

wool mixed, they make frieze, flannel, coarse cloth, and a stuff worked up with flax or hemp thread; and a woof of woollen thread dyed of different colours; this is called *étoffe à deux trames.* With the winter grey wool, they manufacture a stuff termed *Manchester heath.*

In regard to exportation, our wool is sent to Brabant, Flanders, and the other parts of the Netherlands; to Holland, to Saxony, and even to England, where the wool of the lambs, and the fine white summer wool, is worked up by the hatters; and the white summer wool mixed with ox hair, serves to work up the list of cloth.

With the white winter wool, they make stockings at Bremen and in Brabant, as well as caps, coarse cloth, and rugs, for the peasants; and formerly, before the revolution in France, coarse stuffs for the garments of capuchin friars. They work it up, in all manner of coarse stuffs and mattrasses.

In Bremen, and in Westphalia, with the winter grey wool, sorted with white wool, they make a cloth which is sent to Holland, and is in request amongst sailors.

In England, our fine white and grey summer wool is worked up into sailors' hats, and all kinds of coarse cloths, stuffs, and list.

Q. 7. At what age do the breed arrive at perfection? and what is the average quantity of its tallow when fat?

Ans. These sheep arrive at perfection as follows:

1. A ram is in perfect order for the ewe at the age of two years: and no longer fit at the age of five. Then he is castrated, by binding the testicles, which fall off after some time.

2. Wether mutton is good for the table, at the age of four or five years.

3. A ewe is fit for a tup, and to drop her lamb, from two to three; she continues in that state till seven or eight. Sometimes, but very rarely, they are fruitful until ten or eleven.

Their age is known by their occillary teeth, of which when lambed they have eight. And they lose,

(A.) In their first year two; so that the second year they have only six teeth.

(B.) They again lose in the second year two; so that in the third they have only four.

(C.) They again lose in the third year two; so that in the fourth year they have only two.

(D.) They further lose in the fourth year the last two: so that when they are five

years old, at latest, they have lost all their occillary teeth, which are replaced by incisive ones.

The sheep's teeth are commonly worn out at the age of seven or eight years, and they are no longer able to browse on ling, or to suckle a lamb. Their lot is then cast: they are fatted, and appropriated for the food of peasants and servants.

A wether well fatted in the *communage* at the age of four or five years, as the herbage of meadows is too scarce and precious for the pasturage of sheep, will produce four or five pounds of fat.

Those abovementioned, destined for the food of peasants and servants, have two pounds.

Those meant for the kitchen, and fatted within doors, or in a stable, fed with corn, good hay, and other proper food, will have six pounds of fat.

Q. 8. *What in general, is the number of lambs at each birth? at what season of the year do they lamb? and are the lambs well covered with wool when born?*

Ans. The heath ewes drop no more than one lamb at a time. It is very rare that they drop two together. They are in a state for the ram six or eight weeks before Christmas, and drop their fruit in twenty weeks after conception, which event generally happens in the months of March and April.

The lambs, when dropped, have a tufty and frizly, soft, fine wool. It retains these qualities till the first shearing time, about the feast of St. John the Baptist.

Q. 9. *What is considered to be the best method of managing the breed? to what food are they most accustomed, or seems best to agree with them?*

Ans. To treat these sheep in the manner best suited to their nature:

1. The stable should be large, and at least nine or ten feet high, that the exhalations, as well from each other, as from their dung, may easily evaporate. For the same reason, the gates of the sheepfold should also be left open while the flock is browsing in the open fields, to ventilate it, and purify the air by a more free circulation.

2. In the stable, every four days a new litter of dried clods* from the heath should be placed; under which, in winter, it would not be amiss to strew a layer of

* These clods of turf are cut with great dexterity by means of a spade of a very simple construction, which cuts only the dry surface of the heath, in pieces when dried about an inch thick, a foot long, and about six inches broad. These clods also serve for fuel to poor cottagers in villages, and in the neighbourhood of these heaths.

horse dung. The litter should never be of straw, the evaporation of which is pernicious to sheep, as it makes them perspire too much, and catch cold when they return into the open air.

3. The flock should be let out upon the common every day, let the weather be ever so cold or windy; if the snow lies too thick, and prevents them from browsing abroad, then the peasants are under the necessity of scraping away the snow, and scratching up the ground, with an implement termed a *snow-plough*,* with which they carry off all the snow.

4. Great care should be taken in the spring, autumn, and winter, to prevent the flocks from browsing in swamps, filled with noxious weeds and leeches, or in low grounds, and meadows overflowed, either from much rain, or otherwise.

The plants most noxious to sheep are as follows:

Centimorbia, Nummularia, or *Serpentaria minor.*

Agrostis, ulva, juncus.

Spergula (spurrey) much of it is found in fields sowed with buck-wheat; it is still more hurtful to sheep who feed on it after much rain.

5. When the flock has browsed all day upon fallow grounds, or amongst stubble, they should not be led back to their folds till they have browsed upon the common, for an hour or two at least. Green herbs are too succulent, too compact and heavy, consequently too hard of digestion, for the stomach of heath sheep, accustomed to browse upon ling, which is a vegetable of a more solid substance, and being mixed with green herbs, corrects the richness of their flavour.

6. To prevent the sheep from the distempers caused by rain and snow, household salt is given to them, either to lick, or to eat, mixed with the dried leaves of tansey, reduced to powder, and *millefolium* and *origanum, origanum hereacleoticum, enula campana, belenium, aristolochia, absynthium, gentiana,* and juniper berries.

The common and most profitable food of these sheep is ling, from whence the name has been given to the sheep. There are flocks, which from year to year have no other food, than what they can pick up on heaths and wastes. It is only in the months of December, January, and February, when the ground is covered with ice, that they are left to browse on the verdure in the fallow grounds, cultivated the preceding autumn. When during winter there is too much snow on the ground,

* See a representation of the Swedish Snow-plough, Plate XLV. fig. 1.

for the flocks to go out into the fields to find sufficient pasturage, *they give them cut ling within doors, which had been previously stored up for them the preceding autumn,** or oat straw, or straw of rye, buck-wheat, peas, or rape.

To pregnant ewes, and to lambs dropped the year preceding, to strengthen them, they often during the months of January, February, and March, when it snows or rains, give buck-wheat or oats in the morning when they go out, and at night when they return home.

They also give them good hay, mixed with straw; but this only in the winter season; for on the approach of spring, when the grass begins to shew itself in the fields, hay is no longer good for them, the lambs excepted, to which, after they are six weeks old, good hay is given, and the leaves of beech and hawthorn, and occasionally a few handfuls of buck-wheat.

To be provided during the winter season, and snowy weather, with provisions for the flock, and to have wherewithal to furnish them with litter in the stable, it is proper in autumn, when the weather is fine and clear, to cut as much turf and broom as may be wanted for the purpose.

Q. 10. *To what sorts of diseases is the breed particularly subject, and how can they best be prevented or cured?*

Ans. The distempers to which these sheep are the most liable, are,

1. The *Hemorrhage.*—This distemper proceeds from obstructions, which having rendered the feculent matter corrosive, occasions their attacking the intestines to such a degree, that the excrements can only pass the gut of the anus clotted with blood. The sheep affected perish in three or four days, if there is any delay in giving them relief.

As a cure, they give them a spoonful of olive oil, or goose grease; and to obviate the constipation, they are obliged to pull away with the fingers the excrements that stop the natural passage. This operation, which should be repeated until the obstruction ceases, can hardly be performed without an effusion of blood. Some cure it with a bolus of salt butter and soot well powdered, about the size of a goose's egg. After these two ingredients are well mixed up, the bolus is divided into four parts, of which, one must be swallowed every morning. Before this is administered, it is well to bite the tip of the sheep's tongue, until a few drops of blood ensue.

* This is an important fact, and heath or ling hay may be intitled to the attention of our mountain shepherds in the northern parts of England and Scotland.

2. *Phthisic.*—The symptoms of this distemper are a weakness, falling away, and panting, and at times a cough.

Cure. Every morning, for three days, three spoonfuls of spring water, with an ounce of household salt infused therein.

3. *Heat.*—The symptoms of this disorder, and the method of cure, are explained at full length by Mr. Daubenton, in his *Catéchisme de Bergerie*, or shepherd's catechism, translated by Mr. Wiechman. I refer thereto the more, as the sheep on heaths are not particularly subject to this disorder.

It is nevertheless probable, that this disorder participates of the *opthalmy*, a disease which is more frequent in this breed of sheep, and which when they are seized with it, renders them blind, and suddenly immobile, to such a degree as to lose the power of motion.

The best remedy for this disorder is to bleed them under the eye; as soon as a few drops of blood gush out from the incision, the disorder vanishes.

4. The *Phrensy* or *Sturdy.*—The true cause of this disorder is as yet unknown, unless we attribute it to the excessive cold weather in winter, or the violent heats during summer. The symptoms are an apparent insensibility, and great pain; when grazing, they turn round in a circle in the most giddy manner, without heeding where they go, and insensible of their motion. It is some time before this disorder shews itself, and never without the symptoms abovementioned. Reduced to this extreme, after a period of twenty weeks of illness, the sheep are attacked with a violent pain in the forepart of the head (*sinciput*), on feeling which, one perceives a part of the skull, about the size of a halfpenny, so soft, that it yields to the touch of the finger; under this soft part, there is a blister of the size of a hen's egg replete with a liquid, so fiery and corrosive, that the skull is mollified.

To cure this dreadful disease, there is no other remedy, than with all possible precaution to make an incision in the skull, round the mollified part, in such a manner that the skull be pierced to the brain; by raising and falling that part of the skull where the incision was effected, the blister penetrates of itself by the aperture, and is easily removed. This operation concluded, the aperture is closed, and the wound is dressed with butter or soap.

It often happens, that this malignant blister is not precisely seated in the centre of the *sinciput*, but more deeply in the brain, or under the brain, between the horns. In such case, it is beyond all possibility of cure, and the animal falls inevitably a victim to it.

5. The *Broncocele*—the *Rot.*—The chief cause of this disorder arises from the noxious damps in autumn and winter, aquatic plants, such as the *centimorbia*, and from inundated pastures. The animal thus seized, becomes heavy, languishing, and debilitated; on their leaving the sheepfold the neck swells, and this swelling creates under the throat a kind of swelling, named *goitre* in French, which subsides in the night, after they have been in the stable. When the *goitre* appears the fate of the animal is decided; they die in five or eight days. In the *goitre*, in the intestines, and under the skin of the lower belly, a great quantity of a malignant humour is found, and about the liver a kind of flat worms, or leeches are discovered, resembling the leaves of the *centimorbia*, which move on being touched.

This pernicious disease, though neither contagious or epidemic, is nevertheless sufficient to destroy the greatest part of the flock affected with it: even the attempt to cure it is attended with many difficulties, and hitherto a specific or efficacious remedy has not been discovered.

The best preventive is to keep the flock at a distance from swampy grounds and overflown places, or spots filled with noxious plants which spring up in autumn and in rainy seasons; some veterinary professors prescribe as a remedy, household salt and juniper berries; they likewise advise an incision in the lower belly of the animal affected, to give discharge to the humours; but the experiments I have made of this fatal disorder have fully proved to me, that all the remedies invented and hitherto practised in order to cure it have proved ineffectual, unless the disorder shews itself at once, and that such remedies are immediately made use of as are proper to destroy the fundamental causes of the disease, before it has got to a height and become incurable, which may be effected by heartening food.

I have tried rye, which I have given to sheep which I suspected, and were probably seized with the disorder, and let them eat as much as they liked. Those not too far gone, or the disorder not inveterate, were recovered after a few days by this powerful remedy. The others were carried off suddenly.

6. The *Epilepsy.*—The great quantity of blood, the stoppage of the circulation of humours, and the choking up of the lymphatic ducts, are the primary causes of this disorder, which is in some degree hereditary.

To cure this malady, to which other domestic animals are likewise subject, they cut off the tips of both ears, and after having given them as much of the following mixture as may be collected at three times on the point of a knife, viz.

" Red and white bolus, laurel berries, gunpowder, the whole pulverized, infused, " and sufficiently resolved in warm cow's milk, adding from four to six drops of spirit " of turpentine," they are thrown suddenly into a river, and ducked two or three times.

The *Scab*—It is remarkable that the disorders abovementioned and described, are in no degree epidemic or contagious; but this is not the case with the two following.

The scab is by no means a disorder peculiar to heath flocks; it is even singular that they should be attacked by it. In order to obtain a cure, a great number of remedies have been prescribed, which may be seen in the works of Mr. Daubenton, where a true and circumstantial detail of this disorder may be found, its character, definition, and specific remedy.

That which I approve of, is as follows:

Let the scabby sheep be washed every day in the lees of tobacco, infused in human stale, and steeped during three days in the stable in the dung of the sheep.

8. *The Small-pox.*—When this malady infects the flock in the great heat of summer, or in winter, it is the most contagious, and occasions more ravages than all other distempers.

There is no efficacious remedy for its cure, and one is obliged to leave the flock entirely to the skill and care of the shepherd. At all events, to preserve the flock from the infection of this epidemy, or the spreading of the contagion, when it has shewn itself, there is no method more certain, than the following: I made a trial of it last summer, by which means I saved my whole flock, although that of my neighbour grazed along with mine, and had got the infection.

R. asafœtidæ; *nigellæ*; *camphoræ*; *aerugæris*; *flor. sulphur. ana.* one ounce. After having pulverized all these ingredients, they must be mixed together, and the whole infused in olive oil, *quantum sufficit.* It is then divided into nine equal parts, each of which is put into a little bag of coarse cloth; these are fastened to the necks of nine sheep. Every fortnight this preservative must be renewed, with all the contents, and continued till every danger of the contagion has vanished.

Q. 11. *Are there any methods adopted to improve the fleece, either in quality or quantity, and what are found the most advantageous?*

Ans. Several persons engaged in veterinary pursuits, have communicated to us their methods and ideas on improving the wool, and on the regeneration of the fleecy

tribe; but among the number of those who have written on this subject, the following have distinguished themselves more particularly, as well by solid reasoning, as by real experiments, and practical knowledge.

1st. Mr. Daubenton, who, according to the observations of Mr. De Buffon, (on the means of renewing in France the good sorts of the fleecy tribe) made experiments at Auxols in 1768, to improve the fleece by folding the sheep. His example has been successfully followed during the winters of 1785 and 1786; as well at Loriol near Valence, in the environs of Bourgoin, and canton of Dauphiny, as in the mountains of La Grande Chartreuse.*

2d. Messrs. Mouron de Caux, and Dupont of Calais, who have endeavoured to meliorate the breed of the fleecy tribe in France, and regenerate the debased breed of French sheep, by importing rams and ewes from England.†

These examples have been followed likewise in our country, with the greatest success, particularly at Wulfinghausen, Lucklum, Ahlden, &c.

It is incontestable, and proved moreover by a variety of experiments, that the debased breed of sheep may be regenerated, and made more perfect by rams of a better breed, as well relatively to the wool, as to the form of the animals; and I am convinced that the folding of sheep in winter is an efficacious mode of improving their fleece: but however well founded and ascertained these premises may appear, it cannot be denied, and a thousand experiments prove it, that with respect to improving and perfecting animals of the fleecy tribe, every thing depends upon climate, soil, and the mode of treating the animal. Such are the experiments made by myself, as I mentioned in my answer to the 2d Query, and which confirms the truth of what Virgil observes in his Georgics:

Nec vero terræ ferre omnes omnia possunt.

I have made a cross with rams of an excellent breed, denominated *noble*, and the ewes of our country. I have obtained by this experiment a cross breed, preferable as well in point of fleece, as for the animal itself. But the same experiment has demonstrated, to my great regret, " that this improvement only exists during the two

* See Memoires sur l'amélioration de la laine, et la régénération des bêtes à laine, in l'Esprit des Journaux. Novembre, 1788, page 378. And, Avis sur le parcâge des bêtes à laine, Juin, 1788, page 363, in the same book.

† See l'Esprit des Journaux, Octobre, 1789, article *Moutons Anglois*, page 174.

following generations; and that this cross breed is more feeble and delicate than the original breed of the country.

" That the rams of the good race not being able to bear our climate, nor to subsist on our pastures, pine away and die in a short time; and that the fleece of this cross breed, though improved, loses in weight what it gains in fineness." The only advantage I reaped in these attempts towards improvement was, that several of my flock, though they rather dwindled from their primitive breed, preserved, nevertheless, the white colour of the fleece.

The soil, which consists of nothing but heath, only producing ling, and consisting of swampy grounds or marshy meadows, is in general too cold and moist for any other flocks or breed than those of the heaths. Such a kind of soil will neither admit of folding, nor fencing with hurdles, and by its damp exhalations renders the climate insupportable to sheep accustomed to more moderate and milder regions.

Every thing should follow the order of nature; a race of sheep degenerated may be reinvigorated by a ram of the breed it descends from; but however original it becomes again, from not being totally degenerated, it cannot be restored to its primary perfection if they remain in the country, climate, and spot where the degeneracy first commenced; such spot and soil not affording other nurture than what suits only the sheep indigenated, and not producing any thing agreeable to the nature and mode of feeding both of the primitive and regenerating breed. Remove a plant from a barren soil into a rich one, and the success will be indubitable; from whence I conclude, without having made the experiment, that our heath sheep would undoubtedly answer, and improve in a softer climate, when crossed there with indigenous rams.

But to transplant vegetables or animals who drew their existence from a rich soil and a warm climate, into a cold one, is so contradictory, that one would hardly suppose, and much less flatter oneself with a satisfactory issue. My own experience has convinced me of the truth of this assertion. Having procured horses and horned cattle from more northern provinces than that which I inhabit, I have found them to succeed in this climate, and come on admirably. But I experienced just the reverse with domestic animals, which I got from more southern situations.

It follows from all I have said, that, as nature is not to be forced, there is no other advantageous mode of improving the fleece of our heath sheep, than a careful atten-

tion to their health, furnishing them with the necessary quantity of good pasturage, and breeding from the best sorts that can be selected.

Q. 12. *How often are the sheep sheared in the year? Is there any difference of weight or of quality, between what is shorn in summer or in the winter?*

Ans. They shear the heath sheep twice in the year. The first at the feast of St. John, when they shear the winter fleece of the rams, wethers, and ewes, but not of the lambs dropped that year. The second period is four weeks before Michaelmas, when they shear the summer fleece of the whole flock, including rams, wethers, ewes, and lambs. The summer and winter fleeces differ considerably, as well in weight as in quality. The summer fleece is finer, softer, dearer, and above one half lighter, than the winter fleece, which is coarser, harsher, and of less weight and value than the summer wool.

Substance of the additional Information received from Mr. G. G. Marwedel, *in Answer to the Queries of the Board, respecting the Use of Heath or Ling-hay in his Neighbourhood.*

Query 1. *At what season of the year is the ling cut?*

Answer. Generally in autumn, soon after the corn is got in, with an implement called in German *heid zwithe*, or a heath sabre, named *heid sabel.*

Q. 2. *At what age is it cut?*

Ans. There is no fixed time for cutting; it depends upon the rapidity of its growth. When it has grown one foot high, which happens in three, four, or five years, according to circumstances, after the land has been burned, to destroy the old ling, the young shoots which spring up, are cut to the surface of the soil, without leaving any remains.

Q. 3. *How is it made into hay?*

Ans. The cut ling remains on the ground from four to eight days, exposed to the open air and the sunshine, in order to dry it. It does not spoil easily, although it should not be dry. It is made into hay to be used for winter fodder, when the want of grass, hay, straw, or herbage reduces the farmer to that necessity.

Q. 4. *How preserved?*

Ans. It is then easily housed and kept on the floor above the stable.

During winter, when the bad weather prevents the cutting clods of ling for litter, which should be done twice a week, the cut ling is then used, which is given to the sheep at their return from pasture, when the inclemency of the season or deep snow prevents them from browsing. The cut ling is not given to them in the rack, like straw or hay, they take it from the litter.

Q. 5. *Is this food nutritive?*

Ans. The food thus furnished to this kind of sheep, whether from heath given to them in the stable, or what they get without doors, is perfectly sufficient for their support. And when enough can be found, they require nothing more. But to ewes with lamb, during the winter, and particularly some time before they yean, they give, in order to strengthen them, a few sheaves of corn, some rye, barley, or buck-wheat.

This ling is of three sorts, according to the nature of the soil where it grows.

1. *Sandy Ling*, growing in such situations, on heights and mountains.

2. *Marshy Ling*, growing on black spungy soil, and moors.

3. *Aquatic Ling*, on low spots, in stagnated water.

The first sort furnishes the best food for sheep, as well as for bees.

The second is less nutritive.

The third chiefly sought after by bees in the spring.

Ling is described by Linnæus according to its form and flower, and classed in two kinds, viz. *erica vulgaris* and *tetralix*.

Q. 6. *How much ling will nourish a sheep per week?*

Ans. It is in a manner impossible for me to state the weight of ling necessary to support a sheep during a week, not having taken notice thereof; only observing, that I wanted twelve or fourteen cart loads of cut ling, to make litter in the stable during winter, for a flock of 300 sheep, and besides, to strengthen the ewes with lamb, the number of which might be from 120 to 130; and for the lambs, a cart load of good hay, ten or twelve bushels of oats, or buck-wheat, and two *soixantaines* of rye straw.

I know there are flocks which have neither hay, straw, nor corn, and are obliged to subsist upon ling all the year round, more particularly when the winters are mild. Suppose then a sheep should have cut ling in winter, and fed again on returning to the stable, I would reckon every day a truss of twelve or fourteen pounds weight (as the animal will only eat it when it is tender, not what is hard and twiggy,) would suffice for one sheep; and therefore it would require for a week seven or eight

trusses, or from eighty-four to ninety-eight pounds of cut ling: but I am convinced it would be injudicious if it were attempted, to feed a flock in the stable during winter. I would prefer leaving them without doors day and night, which would be more suitable than to confine them in this manner.

His Majesty has now removed me from Hermansburg to this bailliwick on the banks of the Elbe, near Cruxhaven, where I am no longer in a situation to improve my agricultural pursuits, and information acquired at the royal farm at Hermansburg, &c.

Ottendorff, country of Hadeln,
9th July, 1797.

Observations on the preceding Answers.

The above hints may be of considerable service in the mountainous parts of England, Wales, Scotland, and Ireland, where, at present, they find it difficult to support their flocks in the winter season. Whereas, it appears from Mr. Marwedel's communications, that by cutting heath or ling, and making it into hay, they would never feel any material distress of that sort. In these kingdoms such hay need not be put into houses or stables, but kept in the neighbourhood of those places where the flocks are likely to be in winter, and given to them out of doors. It is said that such a practice has been successfully adopted in the upper part of Aberdeenshire. The leaves of the birch, the alder, &c. might also be made into hay; and the young branches of the Scotch fir, both sheep and cattle are fond of; so that it is the fault of the farmers if they have not a sufficient quantity of food for their flocks during the winter season.

[GERMANY.]

XXV. *Answers to the Queries proposed by Sir* John Sinclair, *concerning the Breeding of Sheep in Germany, particularly in Upper Saxony, and the neighbouring Provinces. By* John Henry Fink, *of Cositz, in Upper Saxony; Member of the Economical Societies of Zell, Cassel, and St. Petersburgh.**

Query 1. *Are the breeds in Upper Saxony of native or foreign extraction? are they wild or domesticated? are they hardy or delicate?*

Answer. There are no accounts concerning the original state and descent of the sheep in Germany or Upper Saxony, and I therefore cannot take it upon me to decide, whether these sheep have been originally produced on German ground, or have come over from other countries; or whether they have been originally tame and domesticated, or otherwise. All I know with certainty is, that Germany, especially Upper Saxony, as far as history goes, has never been without flocks of sheep.

Q. 2. *Are they supposed to be pure, or crossed with other breeds? do they differ in size, shape, or any other respect from other sheep?*

Ans. As to the origin and present state of the breeds of sheep in these regions, I shall endeavour to be more particular, and to explain all those circumstances which are likely to throw light upon the subject.

With regard to the origin of our present flocks, I may venture to affirm, that within the confines of Germany, there is hardly one flock to be found, which could be said to descend from pure German blood. For, though it is probable, that at very remote times, the German flocks were allowed to preserve the purity of their blood, because the old and simple Germans were satisfied with any sort of wool, and therefore did not think of forcing different breeds of sheep to mix with one another; yet it is certain, that about one hundred years ago, a higher value was placed upon fine than coarse wool; and that some of the landholders and tenants, began earnestly to reflect upon the method of improving the quality of this important article

* N. B. The value of the coin used in this paper may be easily ascertained by pistoles or louisd'ors, at five dollars a piece; and the value of the weight by Leipzig pounds, 110 of which make a hundred weight.

of husbandry. The means which were employed for that purpose, consisted in their procuring rams of the qualities they wished for, from Poland, Silesia, and other countries, and crossing the ewes of their native flocks with them.

This experiment has not only perfectly answered their expectations, and effectually improved the wool of their flocks, but it has also, as soon as it became known, excited the emulation of the other breeders of sheep, and raised it to such a degree, that throughout all Germany there is, in fact, not one flock to be found of the pure, native, unmixed breed.

But before I mention the properties of this mixed sort, it may be necessary to describe more fully both our foreign and native breeds, beginning with the first.

In the year 1765 the Elector of Saxony, August Frederic, procured 100 rams and 200 ewes from Spain. In the year 1778 the same prince imported into his territories 300 ewes and 100 rams from other countries.

The Spanish sheep have ever since their arrival in Saxony formed a particular flock, distinguishing itself from every other; first, by a remarkably good state of health; for though they were accustomed to live at all seasons in the open air, and to feed on green pastures, as the flocks in Spain, from which they were taken, constantly do, yet they have perfectly preserved their former strength and health, notwithstanding the great change that has taken place in their food and the climate. For in Saxony there is no possibility of procuring any sort of grass from the beginning of December till the beginning of April; nor does the roughness of the winter, which here prevails in those months, allow any species of stock to remain in the fields; a circumstance which rendered it necessary not only to shut up in stables these Spanish sheep, though accustomed to wander about at home, but also to make them live, instead of green food, on hay and straw.

However, this breed not only remained perfectly healthy, but has constantly preserved, in spite of its change of climate, that goodness and fineness of wool which has always been admired in its parents. The common German sheep, on the whole, are neither so healthy as those from Spain, nor does the fineness of their wool remain so constant as that of the Spanish breed. The cause of this phænomenon shall be afterwards explained. To return,

The Spanish breed in Saxony, which is kept separate from all other breeds, and preserved unmixed, has further distinguished itself; some of its rams having been

put to Saxon ewes, the wool of the Saxon flocks has improved to such a degree as not to yield, in point of fineness, to the best sort of Spanish wool.

I have made this experiment, and have, by the use of Spanish rams, perfectly succeeded in converting the coarse wool of my sheep into fine wool, as may be sufficiently demonstrated by the samples of my wool which accompany these observations.

If it should be asked, by what means I have raised the wool of the first pattern to such a degree of fineness as is found in the wool of the second pattern, I can give no other answer, but that during fifteen years I had made it a rule, to cross the ewes of my original breed with no other but Spanish rams; and it is nothing but the constancy I have observed in following that rule, which rendered my wool so fine, and perfectly equal in value to that of the Spanish ram I had used.

I am fully convinced, that my improved wool will never change from better to worse, as long as no blunders are committed on the part of the breeder; that is, as long as I shall take care never to cross a ewe with a ram, the wool of which is inferior in fineness to that of the ewe. In the last case the intended improvement would be retrograde, and the wool become worse.

As to the shape of the domestic sheep in Saxony, and the neighbouring provinces; they are not horned; their head, as far as behind the ears, is covered, instead of wool, with short and strong hair; their legs from above the knees downwards, are grown over with short and strong hair; under the belly they have but little wool; the scrotum in the male sex is very short, and quite smooth, without hair or wool.

As to the breed produced by Saxon ewes and Spanish rams, it is furnished with large and fine horns. These horns, while they are rising above the head, bend a little backwards near the ears, and turn in two, three, or four spiral convolutions, very much resembling the windings in the shell of a snail. The ewes of this breed have no horns; the head is grown over on the front, and round the eyes and jaw-bones, with short and fine wool; but all over the nose, and about the mouth, little strong hairs are discovered; the legs are covered with wool, and not with hair, like those of the domestic breed in Saxony; it has more wool under the belly than the inland kind. We may add to this description of the mixed Saxon and Spanish flock, that the scrotum of its rams hangs down below their hind knees, and is all over covered with fine wool. When we compare the size of the unmixed flocks in Saxony with

the size of the flocks produced by the mixture of Spanish and Saxon blood, we shall find, that in these respects they do not materially differ.

On the whole, it appears to me that the size and bigness of sheep depend in a great measure, if not totally, on the quantity and quality of their food; for it is known from experience, that large and small kinds of sheep have, in their subsequent generations, either increased or decreased in size, when the pastures on which they fed produced either poor and scanty, or plentiful and nutritive, food.

To return to the comparison between the mixed and unmixed flocks of Saxony; these breeds not only agree in size, but also in their tails, which are covered with wool of an equal length, reaching to the middle of their hinder legs, below their hinder knees.

In regard to the other breeds of Germany, it is unnecessary to enlarge upon them, since these flocks are not essentially different from those which I have already described. The constitution of the Saxon and German sheep is robust and hardy; they can bear heat and cold, dry and wet weather; nay, they can live amidst snow and ice without danger, provided they be well supplied with sound and nutritive food, and have not been deprived of their natural clothing.

But if the last take place, and the flocks, after being clipped, are either thus exposed to cold and rainy weather, or are shut up in folds, on a free and open ground, many fatal consequences are likely to arise from such a practice; and I know from experience, that a great part of the flocks thus treated, have either perished, or lost much of their usual strength and vigour.

There is another kind of sheep, however, which is found in Holstein, especially in the surrounding regions of Eiderstadt, in Dietmarsen, a province of Holstein, in the districts of the Wursten, Kedingen, and the marshy districts near the Weser, the Elbe, and the Northern and Baltic seas, which it may be proper to take some notice of.

This kind of sheep is by one half larger than the beforementioned kinds in Saxony. They have larger ears than the size of the body would make us expect; which are, besides, covered with short and strong hair; this sort of hair grows also on their legs (which, proportionally, are somewhat short), and on their heads, to the neck. They have horns, but not such as the mixed Saxon sheep have. Under the belly they have but little wool.

Besides the size and other qualities abovementioned, this Holstein breed differs from all the others in Germany, in respect to their tails, which are not covered with

wool, but with short and strong hair; and not hanging down below the knees, but only as far as the middle of the thigh.

It is supposed that this larger species of sheep is descended from the mixture of a he-goat with a ewe; for it just fills up that space which lies between these two sorts of animals. To be convinced of this, we need only compare the size, shape, and tail of the Holstein kind, with the size, shape, and tail of the goat and the sheep.

The produce of a he-goat and a ewe will breed, as experience has shown; but it is remarkable that a ram with much more readiness crosses a she-goat, than a he-goat does a ewe.

The electoral Saxon minister of state, Count Einsiedel, made, at his country seat (Ehrenberg, near Waldheim), the experiment of crossing ewes from Eiderstadt in Holstein, with small fine woolled Spanish rams. His design was to produce a larger kind of fine woolled sheep.

The Holstein ewe in Ehrenberg, which was crossed by the Spanish ram, dropped two lambs (in Holstein the ewes sometimes drop three lambs at a birth); one of those lambs was a male, and the other a female.

The male lamb, when two years of age, was nearly of the same size as the dam, and had wool of almost an equal length. The female lamb, when two years of age, was much lighter, and shorter in bone than the male. Her wool was much finer, shorter, and more curled, than that of the male. In the size and quality of wool, she resembled more her sire than her dam; but she was a little larger than the native lambs of her age commonly are. I have seen large sheep of the Eiderstadt breed, not only in Holstein and Ehrenberg, but also in Denmark, on the islands Femor, Laland, Fuhnen, and Jutland; but in some places fuller of bone, in others lighter, and that, in proportion as the food they had received was more or less plentiful and nourishing.

These sheep are allowed to run about wild, without a shepherd, amongst bushes, or on fallows, and in large grass districts, which for their use have been inclosed, so that it is only when the snow lies very deep, that they are put into a kind of hovel, and are fed with hay and straw. During the rest of the winter, when the snow does not lie very deep, they live upon the branches of trees, or ling, or old dry grass, which they must seek for under the snow. Nay, often, they drop their lambs on the frozen ground, and I have never heard that any one of them has suffered or perished, by such an accident.

It is remarkable that the German breed with long tails, lose much of their native

strength and vigour in those abovementioned islands and regions, and that the aforesaid larger sheep will not thrive in Saxony.

The larger kind want long and plentiful grass, and ling or heath; but such food is not always to be had in Saxony; for here, the sheep must, during the first part of the summer, feed in pastures which have been eaten off by other cattle, and which, therefore, produce but a poor and scanty subsistence. When, therefore, the large sheep have pastured together with the small breed, on the same ground, and on grass of the above description, they have generally fallen off much, in flesh and bone; their lungs and liver began to ulcerate, and thus many of them have perished, because their food had been too precarious, and not suitable to their constitution. On the contrary, had the very same sheep suffered no want of food, and been well kept during summer and winter, either in stables or without doors, they would have perfectly preserved their health and strength.

But as the large breed did not repay the trouble, which was necessary to keep them well, the farmers and breeders of sheep have resolved to give up the rearing of the large kind, finding that the smaller sort answers their expectations better.

There is still another sort of sheep, which is found in Lunenburg, a province belonging to the electorate of Hanover, and which differs from the common sheep in Saxony.

They are known under the name of Heyde Schmucken, and are remarkable for the smallness of their limbs and body. This breed live in a region, which is extremely barren, sandy, stony, desolate, and offering nothing but ling or heath; and here they must live during the summer and winter, without ever seeing a single blade of grass. In the latter part of the summer alone, they enjoy some compensation for their having endured that precarious mode of existence; for at this time, the ling is young, begins to blossom, and affords them such excellent food, that they become quite fat.

In size, this breed bears the same proportion to the ordinary sort in Saxony, as these do to those bred around Eiderstadt in Holstein. In other respects, this sort has a great resemblance to the Holstein breed; for they are horned, their horns rise above the head, and wind a little backwards; the head is covered over to the neck with little strong hair; the legs also are furnished with hair of the same kind; the ears are proportionally somewhat large; and under the belly there grows very little wool. They are born with tails so short, that they reach only as far as the middle of the thigh; they are, besides, covered, not with wool, but short and strong hair. Their tails, con-

sequently, resemble perfectly those of the Holstein breed, with which the small breed, if we except its size, almost totally agrees.

From this strong resemblance of these two kinds of sheep, I believe it may be inferred, that, originally they were one and the same kind, and that the smaller one has shrunk into its present size, from want of proper food and attendance. For let any one try, and put a flock, or even a few sheep, formerly well fed and well kept, into a barren and sandy heath of the above description, and he will find that the sheep will decrease in size, each generation.

Q. 3. *What is the average weight of its whole carcass, the weight of its fore and hind quarter? the number of its ribs, &c.?*

Ans. A wether of the full growth, without skin or entrails, weighs, in a middle degree of fatness,

1. When of the mixed Saxon and Spanish kind, 40 to 50 lbs.
2. When of the large Holstein kind, 60 to 70 lbs.
3. When of the little Heyde Schmucken breed, 20 to 25 lbs.

In the highest degree of fatness,

A Saxon wether of the mixed kind weighs from 50 to 60 lbs.

A Holstein wether from 80 to 100 lbs.

A wether of the little Heyde Schmucken kind, from 25 to 30 lbs.

The number of the long ribs, which form the breast, and the belly, of these kinds of sheep, amounts to thirteen. The number of the short ribs near the kidneys amounts to four.

Q. 4. *Is the mutton remarkable for flavour, goodness, or delicacy?*

Ans. The mutton of a meagre sheep is dry, and does not recommend itself by flavour; but that of a sheep well fatted is so juicy and delicate, that if not equal, it is at least not much inferior to venison.

The flavour of the mutton is less affected by the kind of food on which the sheep had lived, than is commonly imagined.

Q. 5. *What is the average weight and value of its fleece?*

Ans. The skin of a sheep of the Saxon sort, and without wool, is commonly sold for a mere trifle, because it is used only for parchment, and for lining the coats of poor people. Besides, when dressed, it has so little elasticity, that it is neither fit for gloves nor breeches. However, the price varies according to the quantity and quality of the wool found on such a skin.

Q. 6. *What is the nature, length, colour, and price of its wool? and for what purposes is it best calculated?*

Ans. The wool of some sheep is fine, and of others coarse, as I have already described.

The length of the wool depends upon the age of the sheep. A sound sheep never casts off its wool, as some animals do, at certain periods: on the contrary, we find that it grows from year to year longer and longer, as the hair on the head of man.

But if it should happen that a sheep really throws off its wool, we may be sure that this is a sign of a distemper, from which the sheep has recovered, and which either originated in a fever, or want of food.

The wool of a sheep which has not been clipped for two or three years, grows so long, and becomes so heavy, that the animal can neither rise without difficulty from the ground, nor run any length of time without falling down from fatigue.

When a sheep is shorn once a year, then the length of coarse wool is from eight to nine inches, and that of the fine sort, from four to five inches. As to the colour, the wool is usually white, but sometimes speckled, and sometimes black.

The wool of a new-born black lamb is of a beautiful black colour, but when the lamb grows up, the fine black hue vanishes, and changes into a reddish colour, very similar to that of a fox.

We have no black sheep whose colour would remain unchanged, when exposed for some length of time to the beams of the sun.

The coarse and long wool is worked into a strong and coarse stuff called baize or frieze, and into coarse stockings; the Spanish wool is manufactured into fine cloth; and of the fine and long wool of the Holstein sheep, fine stockings are made. A sort of stuff, called *serge de Nismes*, is woven, and other textures lighter and thinner than cloth, but shining and glossy like silk.

A pound of the finest wool of the mixed Spanish and Saxon sheep is sold for 18 gg.*

A pound of the Holstein or Eiderstadt fine and long wool is sold for 12 gg.

And a pound of the coarse and common wool is sold for 4 gg.

But the price of wool rises and falls according to the state of the market, and the number of buyers and sellers.

Q. 7. *In what age does the breed arrive at perfection? and what is the average quantity of its tallow when fat?*

* The mark gg. signifies *groshes*; one groshe, German currency, is about $1\frac{5}{8}d.$ English money.

Ans. The breeds which I have described (Ans. 1. and 2.), arrive at their full size and perfection a year after they have lost the eight lamb-teeth with which they were born, and after they have got in their stead, other teeth; and this proceeds in the following manner: when two years of age they receive, in the place of the two-edged lamb-teeth in the middle of their jaw-bones, two broad ones. At their third year, they get again two broad teeth, on each side one. At their fourth year, another pair of broad teeth rise up, namely, on each side one: and at their fifth year, the two hindermost lamb-teeth fall out, and in their vacant places two broad ones immediately succeed.

After the sixth year, no sheep increases in size or perfection, but begins to decrease, and to decay.

They remain fruitful till the tenth or twelfth year, if well provided with food; but a sheep's age does not extend much above its twelfth or fifteenth year; and as early as its eighth or ninth year, it begins to lose its teeth from old age.

I have had sheep at fifteen years of age, who had not one single tooth left them, and who were, therefore, reduced to the necessity of chewing their food with the ridge of their jaw-bones. These sheep had lambed to their twelfth year.

But such an age and strength is the consequence of extraordinary health, plentiful food, and careful attendance.

When a sheep or wether has attained to the highest degree of fatness, the weight of its tallow or fat makes one-eighth of the weight of its flesh. In a middle degree of fatness, the weight of its tallow or fat amounts to one-twelfth of the weight of its flesh. But in a meagre state, its tallow is to its flesh, as one to twenty-four.

Q. 8. *How many lambs does it drop at each birth? at what season of the year do they lamb? are the new-born lambs well covered with wool?*

Ans. The sheep being tame and domesticated animals, have no time fixed for their propagation. They are at all times and seasons, fit and inclined to increase their species. But the rams in Germany are allowed to cross their ewes only in the autumn, in order to make them lamb in the spring, when the grass is tender and juicy.

The ewes are big with young during 150 days.

The common native sheep, and the mixed Spanish breed usually drop one lamb at a time. The Holstein or Eiderstadt kind produce two or three lambs at once. And in like manner the little Heyde Schmucken in Lunenburg bring forth two lambs at a birth, if they are well kept and well fed. The Spanish lambs as soon as they are

born, have a sort of wool which is very short and curled; the lambs of other breeds are usually born with long wool of a common degree of fineness. We have no instance of their being lambed quite naked.

Q. 9. *What is considered to be the best mode of managing the breed? what is their common food? and what sort of food seems best to agree with them?*

Ans. The usual food for this species of animals, is hay and straw, of which the first must be perfectly dry, and the other not only dry, but also well thrashed. But this is food used in the winter only. The best food that can be given in the summer is clover, and herbs growing on dry ground, and short grass on hilly regions, as well on heath as on sandy districts; whereas coarse and rank grass growing under shade, and in a moist ground, or that has been overflown by an adjoining river, ought to be carefully avoided; because such grass is seldom sound, and always, when dried for hay, dangerous to the health of sheep.

Q. 10. *To what sorts of diseases is the breed particularly subject? and how can they best be prevented and cured.*

Ans. A particular kind of disease to which our sheep are subject, is that which we call *the turning*, or *the becoming stupid*. The reason of this strange appellation lies in the effect of the disease; for those sheep which are said to turn, or to become stupid, incline their heads towards one side, and turn their body at the same time round, in a circle.

The disease itself originates in a blister of water lying sometimes between the brain and the skull, and sometimes between the cells which inclose the marrow. When the blister was seated between the brain and the skull, the trepan or a sucking instrument has been used with much success. But when the blister lay between the two cells, it could not be taken out without hurting the brain, and killing the animal.

Other remedies, besides what I have mentioned, are not known, at least to me.

However, this disease extends to young sheep only, which are about one year old, and very seldom to sheep of two or three years old.

This distemper prevails not in all our flocks in an equal degree: nor does it make its appearance every year. Some provinces have, therefore, been for some time quite free from it; whilst others have lost in a flock of one hundred head, ten lambs in a year, others only three, and others only one out of five hundred.

This disease is more frequent where the pastures are full of fine grass, than where heath only is growing. Hence it is, that the little Heyde Schmucken in Lunenburg

are very seldom affected with it, and that often, one thousand of them reach the end of their first year, without being attacked by any thing like the above disease. And when it does happen to prevail amongst them, not above one perhaps in a thousand is lost.

It has been observed, that lambs produced by a ewe belonging to a flock where this disease is not quite unknown, and by a ram taken from another flock, where this distemper is more prevalent, have under these circumstances shewn stronger symptoms of their being infected with that sort of madness, than under any other. From hence, I believe, it may be concluded that the turning or becoming stupid is an illness that may be propagated from the sires to their offspring.

There is another distemper to which our sheep are liable, and which is also propagated from one generation to another. It consists in this, that the sheep afflicted with it has got a stiff hinder leg, and reels in moving forward, as if its back was broken. In this state it usually bites its own hinder legs, and tears off from them the hair, together with the skin. Its strength abates, its flesh becomes from time to time more meagre, till at last it cannot any longer keep up with the rest of the flock, and remaining behind, falls on the ground and perishes.

The cause of this disease seems to be a gouty matter.

I had once bought some rams which belonged to a breed, where this disease had gained great influence. Knowing nothing about this circumstance, I put those rams to my ewes, without any apprehension of danger; but ere long I got acquainted not only with the name, but also with the nature of this dangerous distemper.

Soon after this accident, it happened, I know not how, that some rams of my flock got admittance into the flocks of a farmer, and it was observable in a little time that they had introduced into those flocks the same disease, with all its fatal consequences, though it was before that time never known in that farm.

To rescue my sheep from so destructive an enemy, I tried, after some years, to incorporate with my flocks sound and strong rams, taken from a herd perfectly free from this disease; and I am happy to say, that by this means the evil gradually diminished, so as to leave no trace behind it. The same remedy was applied by other farmers, and their flocks were likewise restored to health.

To sheep, thus diseased, half or one ounce of *bella donna* leaves will afford great relief, provided that portion be given them, one day after another without interruption, and as soon as symptoms announce the approach of the disease.

Another distemper, which concerns more the lambs than the sheep, is the making blood instead of water. It is contracted when the lambs feed on pastures which are very fat, or on a ground which produces wild clover, especially of the red kind, more particularly when the weather is moist, and the leaves and stalks of the clover and grass are very juicy and tender. But if the weather is dry, the distemper is less frequent, and if the ground is sandy and meagre, it is scarcely known at all. Even red clover and juicy grass become less hurtful, when both are mixed with grass that is dry and less juicy; or at least when, after the first, the second is given, and this change of food is kept up as long and as often as there is ground to provide against the evil.

The lambs usually die of this disease in twelve hours, or after one, two, or three days; which is also the case with old sheep, when they labour under spasms or the gout, and at last happen to fall into the same disease. But they die in great agonies, violently extending and contracting their belly by turns, and crooking their back.

As soon as any pasture ground contains marks of its producing red clover, nothing is more advisable than to keep off the sheep from such ground; and in case they have been, or still are, upon it, to turn them directly from it, into meagre grass districts. By so doing the distemper either will be prevented, or in case it has got an entrance, it will be stopped in its progress, and by degrees disappear, without infecting any of the sound sheep.

Those sheep which suffer by this distemper may be relieved from their spasms, and soon restored to health, by taking one or two grains of opium, mixed with a little saltpetre.

A very dangerous disease which threatens these animals, is the colic or inflammation of the entrails, which often kills them in six hours, and from which they seldom recover, without the assistance of art. As soon as this disease appears, either clysters must be used, or a vein opened on the forehead.

It is remarkable, that the flocks turned into sandy and poor grass plains, remain perfectly free from this distemper, and that only those which live upon rich and juicy grass are particularly exposed to it.

The small-pox is another known and contagious distemper, which may become very dangerous when sheep are shut up in narrow stables, and by all fresh air being excluded, they are forced to perspire in a violent manner. Though it may be granted that the design of this practice is beneficial, and that the sweat thus forced may faci-

litate the breaking out of the small-pox; yet it has been found, that by such a mode of heating the blood, one-third or one-fourth of the flock has been killed; whereas, when nature was allowed to take its own course, and the sheep were kept neither too warm nor too cold, the loss has not exceeded eight per cent. especially when good food and water was provided for them.

The scab does not kill; it is not propagated by inheritance; and the distinction made between sheep born scabby, and not scabby, is void of foundation; for none are lambed scabby.

There is a sort of scab more violent than the first. We call it *grind*, and believe that ill treatment or hunger is its usual cause. For any animal, when exposed to the pains of hunger, or deprived of what nature demands, will change its state of health, and commonly become scabby.

To keep the sheep free from the *grind*, nothing has proved to be more effectual than to feed the ewes well, that they may produce sound lambs, and to take care that both ewes and lambs are not distressed with hunger; for if we do not neglect to follow this rule, our lambs will get sufficient milk, they advance without interruption in growth, and in the autumn enter their stables with full health and strength: and if they are treated with the same care during winter, we are quite sure that the *grind* will keep at a distance, and that they will leave their stables again in good health. But their winter food must be well dried, and nutritive. To give them, at one time food in plenty, and nothing afterwards for some hours, is a pernicious practice, which never fails to introduce the scab, or the *grind*.

The scab is contagious, as well as the *grind*, but not to such a degree, as to infect sound flocks when they merely pass through scabby flocks.

The scab is best cured by giving better food than usual. A salve composed of turpentine and a little tallow, when applied to the scabby places has also good effects.

But the cure has been performed with greater dispatch when *extractus saturni* well thinned, is used.

Another very dangerous disease is apt to arise, when the lungs begin to rot, or when ulcers attack both the liver and lungs, and produce worms in the vessels. Such symptoms usually terminate in a dropsy, either in the belly or the breast; and if the last takes place, the sheep is past cure.

Salt is a good remedy against the worms in the liver, and when given once or twice a week, has been found to stop the increase of these dangerous reptiles. The

rotting of the lungs and liver may be prevented by avoiding those sorts of food which I have pointed out, at No. 9, as hurtful.

Q. 11. *Have any means been discovered to improve the fleece either in quantity or quality? and which of them have proved most successful?*

Ans. This question has been already answered at No. 1. and 2. where I have shewn by what means I have improved the coarse wool of my own sheep, and how I have raised it to such a degree of fineness, as to render it perfectly equal to Spanish wool.

But not only coarse wool may be changed into fine wool; it is also possible to reduce fine short and curled wool into coarse, long, and loose wool.

The quality of wool seems to depend upon descent, and the quantity of it upon food. Hence a sheep, when fed during the year with so sparing a hand, as just to be able to support its life, brings only half the weight of wool, which the very same sheep would have produced, if its food had been more plentiful.

The most advantageous mode which I know of, for improving the wool to a desired degree of fineness, is to put such rams to the ewes as possess that fineness of wool which we wish to transfer to our flocks.

The more perfect the rams are, which we have procured for our flocks, the more quickly will that improvement go on. Nature does not always accommodate herself to the rapid progress which our expectations of her liberality often anticipate; yet it has been confirmed by experience, that she seldom departs from the following proportions:

Suppose the ram, whose fineness of wool we wish to incorporate with our flocks, to be designated by the figure 1. and the ewe which we unite to the ram to be denoted by the sign o. Now, as the sire is equally necessary with the dam to produce a lamb, it follows that the lamb will participate of one half of the qualities of the sire, and one half of the qualities of the dam; the lamb consequently will be related to its sire as $1 + o = \frac{1}{2}$; that is to say, it will share in one half of the qualities of the sire.

Further, in the second generation let the ram remain 1. and the lamb produced from the first generation let remain in its qualities half; it follows, that the lamb produced from $1 + \frac{1}{2}$ shall be equal to three-fourths of the qualities of the sire.

Let the ram for the third generation be again 1. and the ewe to be crossed by it remain three-fourths, and the offspring of this couple shall possess seven-eighths of the qualities of its sire.

Finally, let the ram for the fourth generation be 1. and the ewe to be put to the ram, be seven-eighths; it follows that the lamb from the fourth generation shall partake fifteen-sixteenths of the qualities of its sire, and almost equal him. It may be easily perceived, that shepherds, by following up these rules, which depend on the unalterable laws of nature, may approximate their wool to that fineness which they would have it attain. Nature, it is true, advances sometimes forward or goes backward contrary to our expectation, yet on the whole she remains faithful to her proceedings. The following rules may, in general, be relied on with safety.

1. He that would improve the fineness of his wool, must endeavour to get as fine rams as possible, more especially for the first generation; for it is evident from what has been above stated, that if the first ram is not so valuable as the second, the improvement must of course advance more slowly.

2. That the wool improves in fineness, in the same proportion as the wool is finer which the ewe of the first generation possesses.

3. That care ought to be taken not to admit a ram for the subsequent generations, whose wool is not equally fine with the first ram. If that should happen, every one must see, that by such an accident, the progress towards refinement must either be stopped, or at least greatly retarded.

4. In case the breeder does not wish that his wool should possess the highest degree of fineness, but only half or three-fourths of it, he can easily accomplish his desire. For he need only take a ram from the first generation one half, and a ewe from the same generation one half; or a ram from the second generation three-fourths, and a ewe from the same generation, three-fourths, and the improvement of the fleece shall stop, so that there will be no change either from better to worse, or from worse to better.

5. But if the breeder is not attentive enough to this particular, and puts a ewe which was used *for* the first generation, or a ewe of the same coarseness of wool with her, to a ram *from* the first generation, and consequently puts 0 to $\frac{1}{2}$, it naturally may be inferred, that the lamb produced by this couple, shall have only one-fourth of the fineness of his sire's wool.

If a shepherd puts a ram from this generation $=\frac{1}{4}$ to a ewe $=0$, the lamb will inherit of its original sire's qualities, no more than one-eighth. In such a case, the line drawn between the sorts to which the ram and the ewe belong, becomes gradually more prominent, and the two breeds which were intended to melt together in

their properties, begin to separate and to return to their former state. And when this happens, it is not uncommon to hear the unexperienced multitude talk in the following manner: it is impossible to improve our wool—we have done and tried all we could. At the first sight it seemed as if it would answer, but we now find by experience that it will not succeed. Our wool at first improved, but not for any length of time; it soon returned to its former coarseness. Our pastures are so bad, that they cannot answer the purpose. They are too hard, too weak, too sour, and too sweet, and so forth. We have not hay enough, its quality is execrable, and how can straw produce fine wool? It is in vain to talk from books. The learned may keep their Latin husbandry to themselves; we know the thing better from experience. Juicy clover, nutritive grass, either on plains or hills, and attention to the proper mode of treating this species of domestic animal, will improve more effectually the fineness of the wool, than all the book learning in the universe.

But however important this practical wisdom may appear, nothing is more certain than, that no sort of wool can be improved, without the methods abovementioned, and that no regular progress in improvement is practicable, without applying those methods with as much accuracy and constancy as possible.

Food has no manner of influence on the quality or fineness of wool. The quality which we discover in the wool of one flock is an essential and distinguishing mark of it from other flocks. It remains unalterable in all subsequent generations, provided no faults are committed on the part of the breeder, which have tendency to render it worse. The quantity of wool depends entirely upon the quantity and nature of food.

If a flock be allowed to suffer hunger, a natural consequence will be, the wool stops in growth, it loses its softness, melts as it were together in clusters, and becomes less useful.

Let any one clip off the bad wool, then feed the animal plentifully, and it will produce more useful wool, which has natural elasticity.

A breeder who would give his wool only a certain and fixed degree of fineness, such as one half or three-fourths, or seven-eighths in the fineness of the ram, may, if he like it, turn fine wool into more coarse, by putting a ram of one half to a ewe of one half, or a ram of three-fourths to a ewe of three-fourths, or a ram of seven-eighths to a ewe of seven-eighths.

Sometimes nature, as I have already observed, seems to diverge from her usual

course, and the fleece turns out to be either a little finer or coarser than was expected, but this she does only occasionally, and it is far from being general. A new born lamb displays no marks of the fineness to which its fleece shall attain in process of time; and no less than a whole year must have passed before it is possible to decide that point with any degree of certainty.

Some have a rule, to breed no more lambs for rams than are absolutely necessary to propagate their flocks. But this custom has a tendency, I will not say to retard improvement, but to make it retrograde. For if there are no more rams reared than are absolutely necessary, it will often happen, that among those rams there are some whose wool is of a lower degree of fineness than was expected. If this take place even in regard to one, the consequences may easily be foreseen.

Those, therefore, who would wish to avoid such disappointments, will bring up twice or thrice as many rams for their flocks, as are absolutely necessary; for, by so doing, he procures himself the liberty of selecting such as will answer best his purpose. And as this double or treble number of rams are to be kept only till they are one year old, he may, after the selection, get the rest castrated. If this remark be duly attended to, there is as little probability that the wool of the flocks in Germany, or more northern provinces, should degenerate from the excellence of its quality, than there is for believing that the flocks of Spain shall cease to propagate the qualities of their fleece. Indeed, were the Spanish breeders themselves to cease selecting for their ewes the most proper rams, or even neglect to do so with their usual care and accuracy, nothing can be more certain, than that those famous flocks would soon sink into contempt.

In Spain but few lambs of the fine wandering herds are castrated, and these are called tame lambs, because they answer the voice of the shepherd, by coming when they are called, and for this reason they are used to lead the flocks. All other male lambs remain rams, and hence it is easy for the breeder to select such of them as are apt to propagate the same fineness of wool, and to preserve its fame.

Q. 12. *How often in a year are the sheep shorn? is there any difference of weight and quality, in the summer and winter wool?*

Ans. As to the time when, and how often, the German sheep are shorn, it is commonly once a year, and that either at the end of May or the beginning of June. The fineness or coarseness of the wool makes no alteration in this rule.

In other provinces the sheep of the same quality are clipped twice a year; the first

time at the end of April or the beginning of May, and the second time at the end of August or the beginning of September. The quantity of the wool clipped at the first period is greater than that clipped the second time; because the first wool has been allowed to grow seven months, and the second only five.

The weight of wool has been found to keep pace with the quantity and quality of the food. A sheep which has got no more, and no better food than was indispensably necessary to preserve its life, produces only two pounds of wool in a year; but, give the very same sheep, in the succeeding year, plenty of good food, so that it fattens, and the weight of its wool will increase to four pounds.

If we consider only those sheep which are neither quite fat, nor quite meagre, but in a state between these extremes, the produce of wool in Germany, on an average, may be estimated in the following manner.

A suckling ewe of the mixed Spanish and Saxon breed, with a long tail, commonly gives in a year, of wool, about $2\frac{1}{2}$ lbs. A ram of the same breed and description, 4 lbs.

A large suckling ewe of the Holstein breed, in the marshes, with a short tail, 4 lbs. A ram of the same kind 7 lbs.

A suckling ewe of the little Heyde-Schmucken, $1\frac{1}{4}$ to $1\frac{1}{2}$ lbs. A ram of the same race 2 lbs.

The reason why the same kind of sheep is clipped in one region twice, and in another only once a year, is, because the breeders wish to sell off their wool in the easiest and most advantageous manner, without being at the expence of exportation. For if there are wool manufacturers or buyers in the neighbourhood, who desire short and fine wool, the sheep are clipped twice a year; but if such manufacturers or buyers desire a long and fine sort of wool, the breeders accommodate themselves to their wishes, and clip their flocks once a year.

But to preserve the health of the flocks, it is, I think, more advisable to clip them only once a year, and that in the middle of the summer. The weather in autumn is very unsettled, at one time very cold, at another very warm; and to strip the sheep in this season of their wool, is to deprive them of the comfortable garments which nature gave them as a covering, against the inclemency of the weather. Besides, these animals, when their naked skin is exposed to cold rain, commonly lose their appetite for food, shrink into a melancholy posture, and endeavour to creep into holes, either under trees, or in buildings, and very evidently decrease in flesh. However, it must be allowed, that by clipping a sheep twice a year, one-tenth more wool is gained,

than by clipping it only once. The reason appears to be, because the wool never grows more quickly than at the time when it has been shorn.

A sheep clipped once in two years will certainly give one-third less wool, than if it had been clipped four times in two years; and a sheep shorn once in three years will furnish but half the wool it would have given, if it had been clipped six times in three years.

The longer the wool, the less quickly it grows, till at last when it has attained the length appointed by nature, it entirely stops, and does not grow any longer.

[GERMANY.]

XXVI. *Communication from the Saxon Electoral Society of Agriculture, on the Cultivation of Potatoes.*

It is with much pleasure that we direct our inquiries towards the best method of cultivating a root of the greatest utility, and of general use in this country, for the support of the labouring class of people, as well as for the food, and the fattening of animals, most essentially useful in rural economy.

This task will be the more easy, as we perceive there is much similarity in the modes of cultivation in both countries.

England having long distinguished itself by its efforts to throw new light and improvement on every branch of arts and sciences, the Electoral Society of Agriculture will feel itself highly gratified in receiving information from time to time, of the improvement made in that country in the cultivation of potatoes; and will always be ready to communicate, in return, the result of similar experiments made here.

I. It is a maxim with us, to preserve our potatoes for a long time fresh, farinaceous, and juicy. We have in Saxony, as in England, five sorts of potatoes, viz.

1. The white potatoe called in German *weisse laeufer*, of a round shape, white substance and flower, replete with pedicles, and of a good flavour and sort.

They keep till the following spring, and are reproductive forty, thirty, or at least twenty fold, in a mountainous soil, tolerably good, and semi-clayish.

2. The red potatoe *(rothe laeufer)*, of a round shape, hard to the touch, and of a reddish hue, red flowers, and pedicles spreading under ground. They are very farinaceous, and the increase will be one-twentieth. They are commonly cultivated in flat and sandy soils.

3. Another red potatoe, called *rothe zapfen*, has no pedicles spreading out, but they are united in parcels, collected as it were in a nest. Red flowers, long shape, red and fine skin. The fruit less farinaceous than the other sorts; they are often aquatic or gluy; thrive in low and fertile soils, and increase one-tenth or fifteenth.

4. Polish potatoes, or potatoes *à la Howard*, white flowers, the substance white, are generally very large, and have few pedicles; grow in a large cluster; and when

first gathered, have a rough aquatic taste, which afterwards becomes pleasant, with a farinaceous substance. They are extremely productive, yielding thirty for one.

5. Potatoes of St. James. These are small, but farinaceous, and of an agreeable flavour; are found lying in tufts at the foot of the plant. They ripen four weeks sooner than the others; their increase one-twelfth.

II. In Saxony also, we have three different methods of planting potatoes.

1. In ploughed fields.
2. In meadow lands.
3. In waste and uncultivated soils.

The first method is the most general: the ground is ploughed in autumn, and again in spring. This cultivation is principally in those parts of Saxony we call the *Circle of Mountains*, and is carried on at the bottom thereof, and in those parts bordering on Voigtland, where there greatest use is for the food of men and for cattle, on which account their cultivation is better understood there than elsewhere.

The following is the method observed in those parts: in a piece of ground, twice ploughed as before mentioned, a furrow is made, wherein the potatoes are set, at eighteen inches distance from each other; or only the quarter part of a potatoe, or even a slice thereof, wherein there is an appearance of a prolific eye.

Then a second furrow is drawn six inches broad, and the earth thrown over the former, to cover the potatoes; a third furrow is next drawn six inches broad, where nothing is set. The fourth furrow is made in the same manner as the first. This method gives a space of eighteen inches distance from one row of potatoes to the other, viz. two furrows of six inches each, and two demi-furrows of three inches each. The distance of the potatoes from each other, in the rows, is also eighteen inches; so that on each square of eighteen inches, there is a potatoe, or the prolific part of one, set.

To plant an extent of 150 square *toises* of seven and a half ells of Dresden, each, or to plant half an *arpent* of 300 *toises* and ells of the same dimensions, it will only require six, and occasionally but five bushels of potatoes, Dresden measure, at the rate of four and a half cubic feet.

There is another mode of cultivation similar to this, called, the method of Tull, which many farmers have begun to practise with great profit, as well for potatoes as other roots proper for a farm. It consists in preparing the soil by ploughing it in autumn, and two spring ploughings; to harrow it carefully in the interval between

the ploughings, and particularly after the last; to trace, at the distance of thirty inches from each other, with the plough called *charuë à croc (hackenpflug)*, the furrows where the potatoes are to be planted, and to throw in the dung, and cover them over with earth, by means of another furrow made with the common plough; and to plant in this earth which covers the first furrow, the potatoes or the shoots thereof, at thirty inches distance from each other, so as to have one potatoe set on a square of thirty inches.

In either of these modes of cultivation, we avail ourselves of the soil unemployed between the planted furrows, to destroy darnel, and to heap up the earth, making use for this purpose, of the plough *à croc* after the other; they make use first of the common plough, and then the plough *à croc*, to which two ears are fastened, and then it is termed *an eared plough à croc (flugelkachen)*.

In a clean soil it becomes only necessary to eradicate the darnel in damp weather. A soil in a less good condition requires this attention continually. When the shoots are sprung up as much as necessary, their branches are so tufty and extensive, that the empty square spaces of eighteen and thirty inches are entirely covered, and no interstice whatever is visible.

Except in the countries abovementioned, the most common method of planting potatoes, is as follows:

The ground is ploughed in autumn with the common plough, or such who dwell in single cottages, hoe or dig the ground. This being repeated, it is harrowed in the spring; those who have no other implements, level the ground with a rake; then with a hand-hoe they make, on this ground whether ploughed or dug, smaller furrows distant from each other. The potatoes are set and covered over with earth with the hand-hoe.

When the leaves shoot out intermixed with darnel, the latter is torn away with a hand-hoe, heaping up the earth on all sides round the plants. This must be done frequently.

In gathering the potatoes they make use of a large hoe termed *breite krautbacke*, to pluck the potatoes out of the ground, when the first method of planting has been used with a plough *à croc*, at the extremity of which is affixed with a leathern thong, an iron mallet blunted, to give a gentle motion with this instrument, called the *goose's foot (gaensfuss)*, to the furrow filled with roots, and get them out in this manner; this operation completed, the field is harrowed and gleaned.

The second method of cultivating potatoes, in meadow land covered with grass, is not so common, but is practised to ameliorate meadows less fertile, rather than breaking them up. Thus, in farms of some extent, they give to such peasants as have no land of their own, and wish to cultivate potatoes for support, small plots of ground of this description to manure for potatoes, and during three years; after which the ground is properly prepared and manured to sow grain for one year; then they sow copiously seeds, of the choicest kinds of herbage.

This cultivation is as follows: after an early ploughing in autumn, the ground is dunged, which is never omitted except when the quality of the soil is very good. The spring ensuing, after the autumn ploughing, it is ploughed in an oblique or transverse direction, with the plough *à croc*. The same is done with the harrow, first lengthwise, and then crosswise. The furrows where the potatoes are to be planted, are traced superficially with the plough *à croc*, at the distance of thirty inches asunder; the potatoes are set in rows, at the distance of eighteen inches from each other, and covered over by the next furrow; giving always the preference to the Polish potatoes.

The earth is heaped up round the plant by means of two furrows drawn on the right and left; a fortnight after, the spare earth between the furrows is turned up by means of the plough *oreillée à croc*; after another fortnight, the ground is dug with a mattock, to destroy any darnel found there, which is plucked up with the hand.

The poor labourer, unprovided with implements, or a plough, is obliged to do every thing with the hand; of course, as this operation requires more care, the great farmer prefers the work thus done, as tending more to ameliorate the soil than that which is performed by the plough.

The third mode of cultivating potatoes, in waste and desert places, and where there is no wood, and in uncultivated spots, or in swamps, is more suitable to light soils than to rich ones. The ground is prepared by paring and burning. The drainage of marshes of course implies the necessity of deep trenches and sluices.

III. Perhaps the crop of potatoes in Saxony might be calculated in the following manner:

According to the distances and spaces in planting, as already mentioned, for 150 square *toises*, at the rate of seven and a half ells each, it is judged that five, or at farthest six bushels of potatoes (Dresden measure), containing each four and a half cubic feet, and 100 lbs. weight.

These 600 or 500 lbs. will produce 12,000, or 16,000, as far as 20,000 lbs. The potatoes having produced respectively the twentieth, thirtieth, and fortieth increase; 100 lbs. of potatoes sell together at the rate of sixteen *grosses*, Saxon currency. Consequently, the produce of half an *arpent* of 150 square *toises*, might be valued at 80, $107\frac{1}{2}$, and $133\frac{1}{2}$ crowns of Saxony; from whence deduct the following:

Rent of the ground - - - -	4	crowns.
Ploughing - - - -	3	
Manure - - - -	6	
Cost of potatoes for planting, about -	4	
Cultivation - - - -	$1\frac{1}{2}$	
Expences of getting in the crop - -	$0\frac{1}{2}$	
	19	crowns.

The next produce would be, respectively, 77, $88\frac{1}{2}$, and $174\frac{1}{3}$, Saxon crowns.*

If we compare the above net produce with the produce of an English acre, where from 200 to 300 lbs. weight (the bushel, at the rate of 75 lbs.), give from 15,000 to 22,500 lbs. weight; and if we consider at the same time, that the English acre is much smaller than the *arpent* of Saxony, it will be found that the difference is trifling in point of cultivation, but greater in regard to value.

IV. A double crop.

This never happens with potatoes in Saxony; the late frosts in spring are contrary to it. In many places, it is true, the fields are cultivated with the same care as gardens, and ploughed more than once in the year, and principally in the forest *Sus-Spree* in lower Lusatin, and in the neighbourhood of great cities, where such cultivation is carried on with much success; but then, they vary the plants, mixing with such as ripen early, others more tardy, so that the former may be gathered, while the latter are shooting up above ground.

V. In this country, rye comes in rotation next to potatoes. Barley and oats would also do very well after potatoes, but rye is more productive.

VI. The instruction herein stated for the preservation of potatoes, is the general practice in all this country, and with good success, especially in dry and sandy soils;

* A Saxon crown, is 3*s*. 6*d*. English, calculating more or less upon the par of money, without reference to the fluctuations of value according to the course of exchange, 24 *grosses* make one Saxon crown.

but in a fat and humid soil we dare not practise it; and therefore a good storehouse is preferred. During the moist weather, which is very prejudicial, and such we once had for twenty years together, the following method was devised as the best for preserving the potatoes: they were first cut into different slices, and after being thoroughly dried, were deposited in a granary, either to be pulverized and baked as bread, or to steep them, and serve them out half boiled, as food for cattle.

VII. In this country the fields have not large borders; but should this ever happen, they are covered with herbage, and employed as pasturage for cattle. In the mountainous parts of Saxony, all little corners and detached plots of ground which can be dispensed with, are ceded to poor cottagers, who have no ground of their own, that they may raise potatoes thereon by hand.

VIII. In thrifty families we are persuaded they might use baked potatoes as bread, in the manner we have described.

The common people like better to eat them boiled with a little bread: but if the potatoes are to be made into bread, the process is the same as we have recommended above, section VI. and mixing the meal thereof with a little flour of rye or of wheat.

[GERMANY.]

XXVII. *Calculation of the Profit to be derived from keeping Sheep in Cots for their Manure, rather than folding them. From the Experiments made with all possible exactness, in similar Circumstances, by Baron* Itzenplitz, *a Foreign Honorary Member of the Board of Agriculture.*

I. 1600 sheep of all ages, fully fed, as well in the stable as in pastures, when the seasons permitted, and sufficiently provided with fresh straw, as often as their dung became humid, have furnished, during the space of seven months, from 15th October till the 4th May, in the stable, a quantity of manure sufficient for 77 acres, $39\frac{1}{2}$ rods, English measurement. Thus 100 sheep have furnished manure for 4 acres $132\frac{1}{2}$ rods, in seven months, and for $110\frac{1}{2}$ rods in one month.

II. 1600 sheep sufficiently fed on extensive meadows, have given (during the space of five months, from the 15th May to the 15th October, when they were folded, without the expence of straw or of carriage) the manure requisite for 41 acres 18 rods. Thus 100 sheep have afforded manure for 2 acres 91 rods during 5 months, and for 82 rods in one month.

The first manure is deemed sufficient for three or four crops, and the second for one or two crops; nevertheless, where straw is scarce, and where the soil is light, sandy, and loose, folding is preferred, and practised with care, as it gives a solidity to the soil. The feed of our sheep, both in summer and winter, is weaker, drier, and less succulent than in England, where they have sheep of the large breed; therefore the same number of sheep must yield a larger stock of manure than with us. But the proportion between the cot, or when folded, would not be much altered thereby.

[GERMANY.]

XXVIII. *Translation of Extracts of Letters from his Excellency Count* Hertzberg, *to the President of the Board of Agriculture,* in February and June,* 1794.

I HAVE read and examined with care the various pieces you have communicated to me, regarding the formation and progress of the Board of Agriculture, the establishment of which does so much honour to the Parliament of England. I have no doubt that great things will be effected by it, more especially if the committees are conducted by intelligent and patriotic members.

Of agricultural societies, we have too many in Germany. I am president of that of Brandenburg, at Potsdam, and of two others in Prussia and Westphalia; but they are not supported by the government, like yours in England, and depending alone on the patriotic zeal of individuals, they are not enabled to follow a regular settled plan.

It is imagined here, that your rural economy is already perfect, and that you have no waste lands or commons; but I believe that you have still many, as well as other agricultural imperfections. Commerce certainly contributes much to the advantage of a nation; but it seems to me that agriculture forms the basis of all good government; and I wish, that nations, and those who govern them, were every where sensible of that truth.

It is certain, that there is a great difference between your soil, as well as government, and ours in Prussia. Our soil is almost every where weak and sterile, whereas a large proportion of yours is distinguished by its fertility. In Prussia one half of the kingdom is possessed either by the sovereign, as domain, or by the nobles, and the remaining half by common proprietors. One of the best institutions we have is

* Count Hertzberg, the celebrated minister of Frederick the Great of Prussia, in whom he placed such confidence, and to whose wise counsels the splendour of his reign may in a great measure be attributed, was early admitted an honorary member of the Board of Agriculture, and entered with peculiar zeal into the important benefits that might be derived from such an institution.

that of *provincial counsellors*, who govern each circle or province, usually consisting of about one hundred villages; they are commonly proprietors of land situated in that district, and of the order of nobles, but they are elected by the other proprietors. They collect the revenues of the state, publish and enforce the public ordinances, and represent each province in the States General. I have endeavoured to explain the nature of that office in my academical dissertation, intitled "*La Prusse non "despotique.*"

The question, about the decision of which we are chiefly occupied at present, relates to the most beneficial rotation of crops, whether we should divide our arable land into three or four divisions, leaving a third or a fourth part fallow, or into seven, nine, or thirteen, according to the practice in Mecklenburg. The king having recommended that subject to the attention of the academy, it was frequently discussed, and a premium of 50 ducats was given to the person who gave the most useful information respecting it. The academy at last decided in favour of that paper which recommended that one-fourth part should be in fallow.

I continue to make great progress in the culture of national silk; and if we are fortunate enough to have a favourable season this year, the quantity will be very considerable. Our silk manufactures are likely to prosper, as those of Lyons fall into decay, and strangers already come to purchase our fabrics. By distributing medals to those who could produce five pounds of raw silk, adding two Fredericks of gold (equal to about two guineas English), and inserting the names of those who obtained the premiums in the gazette, I have already the satisfaction of finding above one thousand places where the culture of silk is successfully attended to. The silk-worms are fed in a large room, where, in the winter season the school of the village is kept, and in the summer the culture of silk is carried on.*

* If silk may be obtained in Prussia, there can be no doubt that it might be cultivated to much greater advantage in the southern parts of England. The failure in the reign of James the First ought not to operate as any discouragement, for the proper management of the silk-worm was not then known. There can be no doubt of the white mulberry thriving in Hants, Dorset, Devon, and Cornwall. The eggs should be obtained from Prussia, being the most northern country whence they are to be had. The principal difficulty formerly was, that of preserving the leaves in a moist climate, but it is now found, that if moderately kiln-dried they would answer the purpose perfectly well.

[DENMARK.]

XXIX. *Translation of a Letter from his Excellency Count* Bernstorff, *late Prime Minister in Denmark, to the President of the Board of Agriculture; dated 2d of August, 1794.**

SIR,

NOTHING could be more flattering to me, than the letter I had the honour to receive from you, acquainting me of my being elected an honorary member of the Board of Agriculture, an institution so dear to all enlightened Europe. I accept of the same with the most distinguished acknowledgments; and I request of you, Sir, to be the interpreter of my sentiments on this occasion, to the Members of the Board. Natural history and practical husbandry have ever been my favourite pursuits. The latter I have attended to with the greatest attention on my estates in the different provinces, where the climates and customs are perfectly dissimilar. I have frequently observed, that a single village has a superior mode of cultivation, which is not followed by their neighbours, and the very farmers themselves are not able to account for the circumstances whence it originated, nor in what other districts it might answer. It is of the utmost consequence, therefore, that there should be a national establishment for receiving and circulating all such information, and I hope the Reports of the Board will answer that important purpose in England. What particularly gave me pleasure, was to see your Reports accompanied with engravings of agricultural implements; nothing can be more interesting, nor of more general utility. The greatest superiority of British agriculture, however, as it appears to me, consists in

* Count Bernstorff is acknowledged to be one of the ablest statesmen of modern times, with whom, as well as with Count Hertzberg, Count Orlow, and many other respectable characters, the President of the Board of Agriculture had an opportunity of establishing a correspondence and friendship, during his excursion through the northern parts of Europe; and which has enabled him to procure for the Board so considerable a mass of valuable information from foreign countries. This letter from Count Bernstorff is principally preserved for the purpose of exhibiting the character of a great minister, devoted to promote the prosperity and public interests of his country, and indulging himself in the study of his favourite objects (those of agriculture and rural economy) in hours taken from repose.

the knowledge and choice of live-stock. We are much behind hand in our country in that respect. Some trials, and even experiments of consequence, have been attempted, but these are exceptions, and the bulk of the people remain in ignorance.

An overpressure of weighty affairs seldom affords me the possibility of indulging in my favourite pursuits, unless at hours snatched from repose. I shall now, however, renew them with eagerness, and shall never lose sight of any object wherein you may please to employ me.

I am, with the most distinguished sentiments, &c.

BERNSTORFF.

[SWEDEN.]

XXX. *Observations on Sheep, particularly those of Sweden. Translated from the Communications of Baron* David Schulz *de Schulzenheim, a Foreign Honorary Member of the Board of Agriculture.*

CHARLES the Ninth brought over to Sweden a German shepherd, with 100 German sheep; and a further amelioration of the breed of sheep was projected in the reign of Gustavus Adolphus, and of queen Christina. But it is to a later period that we must more particularly ascribe the honour of having promoted with activity the improvement of sheep-farming. By the endeavours of the late Sir Jonas Alströmer (counsellor of commerce, and knight of the order of Vasa), that most zealous improver of the breed of sheep, there was established in the year 1739, near Alingsos, a school for shepherds, with a salary for a master shepherd brought from abroad. The same gentleman had already procured, in 1715, some fine woolled English sheep; in 1723 some Spanish, and in 1726 some from Eiderstadt. Provincial shepherds, instructed by the master shepherd, and lecturer, on political economy at Alingsos, were ordered for each county: but as the employment of persons of this profession, though but ill paid, came, in the long run, to fall heavy on the public; and at the same time tended to introduce into the management of sheep, refinements which the simplicity of nature does not require, an end was put, in the year 1766, not without reason, to this shepherd establishment, which had perhaps, at its original commencement, been useful.

In the year 1741 premiums began to be distributed for the best breeding rams of the Spanish and English race, which were sold to the country people. The peasants were besides this, encouraged by rewards given for good breeds of sheep. From the last mentioned year to the year 1780, there were distributed premiums of 25 per cent. on the value of genuine Spanish, English, and Eiderstadtish wool, sold to the woollen manufacturers; on which account there were also employed certain appraisers, who were paid at the wool warehouses of the Board of Manufactures. From the Transactions of the Royal College of Commerce it appears, that from 1750 to 1760 the annual importation was already at a medium, 4,468 pounds less than during the ten

preceding years, although the manufacturing of cloth had rather increased, and foreign cloths could only be got into the country by means of smuggling. In 1781, the premiums were lowered to 15 per cent. and in 1786 to 12 per cent. The premiums on wool were paid till the beginning of the *Realisation*, in 1776, in dollars copper, which, with a variation in the course of exchange during those years, from 36 to 72 marks and upwards, might at an average be reckoned at 54 marks to a rix-dollar, in specie: and the sum total of the premiums distributed during forty years, amounts in Swedish rix-dollars, to 235,575 47*s.* 4*r.**

During the above forty years, the cloth manufacturers are known to have received, at a medium, a yearly supply of fine wool of home production, which passed through the wool warehouses of the Board of Manufactures, of 85,074 pounds; foreign fine wool imported, 65,576 pounds, making together, 150,650 pounds. But if the amount of the home and foreign finer wool be reckoned only for the last twenty years, the annual average arises to 186,232 pounds. The premium wool of home production has, during the last ten years, considerably exceeded the quantity of foreign fine wool imported. And that the quantity of home-bred fine wool from the fine woolled Spanish race is perceived to be smaller in the table for the years 1789 and 1790, by no means proves any diminution of the stocks of sheep; for since the wool in the wool warehouses was merely appraised at about half of what the manufacturers paid for it, and since the premiums were not only lowered to 12 per cent. but also during the last three years were not paid ready money, the sheep farmers came more than formerly to sell their fine wool directly to the manufacturers, without depositing it in the wool warehouses; that round about way, being besides attended at all times with difficulty and loss of time to the country people who live at a great distance. Some persons also cause cloths to be worked out of their wool by the manufacturer, on their own account, paying for the labour; and besides, people are become more expert in private houses in the art of spinning fine wool.

As the Board of Manufactures can only state the amount of the premium wool which has been appraised and sold in their warehouses, it is scarcely possible to fix the precise quantity of the fine wool of the Spanish kind produced in this country. According to the report made by the provincial shepherds, there were in the kingdom in 1764, 88,750 genuine fine woolled sheep, without counting 23,384 good sheep of mixed breeds. If perfect credit could be given to the first of these num-

* Equal to £ 54,626. 6*s.* sterling, reckoning the intrinsic value of bullion.

bers, it would give room to conjecture, that in the above year there was in the country a stock of 266,259 lbs. of fine wool. The annual fleece of each Spanish sheep may reasonably be reckoned at 3 pounds, without adding to it the wool of the belly and legs, which however the manufacturers are accustomed to let pass at the same price with the rest, when it is found to be well washed. How much ought to be deducted from the quantity stated, on account of dirtiness, it is equally impossible to determine, as many people neither wash the Spanish species of wool before nor after the shearing, so that the proportion may vary from 20 to 50 per cent.

The specification of the several quantities of wool which are deposited every year in the public warehouses, does not prove with certainty the number of sheep farms, since certain housekeepers who live at a distance from the Board of Manufactures, sometimes lay up their wool during two years; and others who live nearer, now and then send their wool, in separate parcels, for each of which they receive different *numeros*. Commonly, large flocks of sheep are not kept on each farm: for though several hundred sheep are kept through the winter on certain gentlemen's estates, which together may form about one-eighteenth part of the 80,713 farms *(hemmantal)* older and newer, which our country is supposed to contain; yet on the greater number there are maintained only about fifty head, and often much fewer. It is beyond all doubt that the race of fine-woolled sheep has annually increased in this country, since the advantages thereof came to be better known, and since the management of them has been remarkably simplified. It is also not to be denied, that the public encouragements for the propagation of the Spanish race of sheep have been carried among us to the greatest height. Yet at the same time, there is no danger of the foreign races disappearing, together with the premiums, which would be the case with many other costly and brilliant establishments.

Our demand for foreign, Spanish, and Portugueze wool is probably at present still greater, than the importation in the table for the year 1789 and 1790 seems to indicate. The Swedish navigation was at that time cramped by the disturbances of war, and the manufacturers could hardly employ themselves in any thing else than weaving by commission. On the other hand, the extraordinary great importation of fine wool in 1778, and the years about that period, may be attributed to the change of the Swedish dress, and the fall in the price of Spanish wool, during the English war. A great part, however, of the Spanish wool here mentioned is by no means of the finest sorts; for instance, *Caceres*, or Estremaduran, Andalusian, and Portugueze wool,

and several *Lanas Churras*, as they are called. It is the Segovian, and particularly the genuine Leonese wools, which, however, are usually comprehended under the name of *Pilas, Leonesas, Segovianas*, which give to cloth the distinguished softness, on which the courtier sets so great a value. The so perfectly fine Spanish cloth, which has the softness of velvet and satin, and which we generally see come in presents to other countries, is not worked from the wool of Spanish sheep, but from the wool taken from the Peruvian Vigogna, Lama, or Alpaca (*camellus glama et pacos Linnæi*), which is of the camel species, and which will scarcely (it is probable) be introduced into Europe, though it should seem that, they ought to thrive equally well on the Spanish, as on the Peruvian mountains, which are still higher, and covered with snow. Vigogna or Vicugna cloths, however, are said to be frequently adulterated by a mixture of sheep's wool, or beaver.

It appears from the public accounts, that the importation of foreign coarse wool has during the last years decreased, and consequently the coarser species of sheep in the country, far from falling off, have rather, during the importation of the fine woolled Spanish race, been gradually multiplied, as the consumption, together with the progress of population, must have increased. Our manufacturers work coarse articles for the most part of foreign wool. The degree to which clothiers, stuff-workers, hatmakers, and different other workmen are furnished with coarse wool of home production is inconsiderable: this our inhabitants must themselves use. During the last war, when an extraordinary quantity of commission goods were worked, the importation of coarse wool might have been conjectured to be greater than the preceding years; but that the case was otherwise, proceeds from this, that the stuff manufactures fell into decay, in consequence of the people having begun to use silk and cotton articles for under garments, and lining for clothes. There is also a greater quantity of English woollens imported by smugglers at present, than formerly.

An examination of our public accounts, would also ascertain to what towns in this wide extended kingdom, and from what places, the finer, as well as the coarser foreign wool has been imported. The Polish and Lithuanian wool, which is brought here from Dantzig and Kœnigsberg, forms, among the coarser sorts of wool, the greatest quantity. An attempt has also been made, by means of premiums of twelve per cent. to encourage the Polish race of sheep; but very few persons have found their account in it. Besides the inconsiderable importation of Russian wool, which has a

great resemblance to the Polish, there are also imported, for the purpose of furs, skins of black lambs, taken either before they are lambed, or immediately after. It is beyond all doubt, that the good management of sheep is carried the furthest in the southern part of Sweden, or what is called the kingdom of Gothland. But Stockholm, although situated in Upper Sweden, draws to itself, as the capital of the kingdom, the greatest quantity both of home and foreign fine and coarse wool. The public warehouse at Norrkœping has, however, some years received for appraisement more premium wool of home production, than the warehouse of Stockholm.

The total number of the Swedish breed of sheep, cannot be otherwise stated than according to probability. To provide our nearly 2,800,000 inhabitants, older and younger, annually, with the necessary wool, it would seem that at least three marks* for each person, or the fleece of an old sheep, with a proportional addition of the wool of the increasing race of lambs, is necessary. Now, if 2,800,000 full grown, more or less woolly sheep, together with the year's lambs, are supposed to yield at an average three marks of wool, there results from thence a quantity of 8,400,000 lbs.

From which is to be subtracted the medium importation for the last 20 years, of Spanish fine wool - - - -	64,947
Also the average of foreign coarse wool, imported during the same period, viz. 30,705⅗ stone, or - - - -	614,108
	679,055 lbs.
There remains - - -	7,720,945 lbs.

This balance gives room to conjecture, that there are now maintained during the winter, in Sweden and Finland, 2,573,648 sheep (not reckoning the additional lambs of the year) or 31 or 32 sheep at an average on each farm. On certain gentlemen's estates, with their dependent cottage-farms, as also in those provinces, which are provided with good pastures and abundant hay, a greater number of sheep are kept upon each farm; but this must take place in a less degree, where the ground is overgrown with wood, or marshy: and in a land so unequally cultivated, and which stretches from the 55th to the 70th degree of latitude, no perfect uniformity in this case can take place; but if the breed of sheep continue to be augmented in the same progression, in a few years, Sweden, which is at least six times as large as England, so famed for her profitable sheep, must be able to do more than supply her own wants, with almost as

* A mark is much the same as a pound.

good kinds of wool as the Spanish, and likewise with the coarser kinds resembling the German and the Polish. In the whole of Great Britain, there are maintained, it is supposed, at present, 28,800,000 sheep, which together with 2,037,000 lbs. of Spanish wool, the medium importation into that country, must give an annual stock of nearly 88½ millions of pounds of wool. This quantity again divided among eight millions of people, would amount to above 11 marks of wool a man; but at this rate it would appear, that hardly one-third part of the woollen manufactures remains in the country.*

Of the farms above stated, which supply the Swedish cloth manufacturer with premium wool of home production, of the Spanish kind, there may be two belonging to the writer of this paper. At the one of these, a race of Spanish sheep, of near fifty years standing, is kept. I have six different times brought from Spain, both rams and ewes, with a view, if possible, further to ameliorate the Spanish breed of sheep already on the spot. I had also of late years an excellent opportunity, by means of a friend and relation resident in that country: but as a proof that even in the Spanish provinces, noted for the breed of sheep, real fine woolled sheep are not so common, I must mention that of six different cargoes, consisting of Leonese and Old Castile sheep, procured with great pains, not more than a single one, which arrived here in the year 1778, surpassed the former race. All the others were far below comparison with them; on which account also, the appraisers at the public hall strongly dissuaded all mixture of the four latter parcels of Spanish rams and ewes, with my former stock. What value is put in Spain itself on a choice ram, appears by this, that for such a one, according to Baron Clas. Alströmer's ocular evidence, a curious sheep-farmer in the country will pay as high as 100 Spanish ducats.

The capital sort, which arrived in 1778, was of the Leonese stock, which I also think has the preference over the much renowned Castilian race, from Segovia, Soria, and Burgos. The wool of the above sheep was of the sort, which the English call *clothing wool*, which is very soft, greasy, curly or rather wavy, thick matted together at the top, and is preferred by the clothiers, because it *felts* better, and makes a finer cloth, than the sort which is dry, hairy, pointed at the extremities, bushy, and commonly longer and thinner. The wool of the less fortunate cargoes of Spanish sheep, resembled more the last described, or Andalusian species, though consider-

* Wool is made use of for various other purposes in England besides that of cloth, by which immense quantities are consumed, as in carpets, upholstery, sadlery, in articles for carriages, &c.

ably finer than the Barbary, Roman, or English sorts of wool, which are called *combing wools*. The last mentioned sheep were larger, and especially longer legged than the Leonese, but gave a much smaller produce than their bushy and upstanding wool seemed to promise. The Leonese breed, which I imported, have also a pretty stout trunk or body, which is covered with a thick wool, quite down to the legs, which are very short. As a mark that their descendants were of the genuine race, I observed, besides the softness and abundance of their wool, that half of their ears were brown, like the first stock. The Leonese ewes also lived to see five generations in lineal descent from themselves, of which none have degenerated in point of fineness of wool, upon the most accurate comparison. The wool from the above two farms, is now reckoned of the first quality of Spanish wool of home production, in the public warehouse at Stockholm. It is divided, with a view to the appraisement, in the Spanish manner, into 1st, 2d, 3d sort; but it has for several years, without counting the per cent. premiums, fetched from the manufacturers, one sort with another, twenty-four skillings (half a rix dollar), and twenty-four skillings eight *rundstycke*, and last year thirty-four skillings.* The purchasers themselves likewise own, that they seldom get wool from Spain, that is equal in quality to that of my breed of sheep.

With regard to food for sheep, it has been found here, as it has been found in some other places, that the most proper pasture, is the fallow fields in summer, and the stubble fields in autumn. The idea of some people, that rich pasture is not the most proper for fine woolled sheep, is certainly ill-founded. Different kinds of *trifolium*, *medicago*, *lotus*, *vicia*, together with other *diadelphists*, which grow in abundance in the fields, form their most favourite food, provided the growth of these plants be not too rank. The objection that sheep are more apt to dirty themselves on summer fallow is unimportant when applied to the best Spanish breed; for their wool, matted at the points, is covered over, and stuck together as it were with a varnish, by means of which the interior wool preserves all its cleanness, and its white colour, which only acquires somewhat of a yellowish cast from its greasiness. On the outside, the choicest sheep appear as if they were done over with a dark brown paste, and they can thus be separated, at first sight by a person of skill, from the inferior kinds, which are whiter on the outside. Although an industrious farmer does not leave broad headlands in his fields, and cleans his ditches frequently, yet in this country there are considerable hills on

* Intrinsically equal to three shillings and four pence sterling.

almost every farm. Sheep are also much accustomed to feed upon the tender and rich weeds which they pick from the fallow, which at the same time, they manure. If the summer fallow is not sufficient for pasture, high lying grass inclosures are chosen for that purpose: and though the situation of our country is subject to various inconveniences, yet our woods give us easy opportunities, by means of palings, to make many separations; so that we are not under the necessity of having recourse to commons, and heaths for sheep pasture, by which the breeds are apt to be mixed. Shepherds and dogs are for the same reason unnecessary with us in Upper Sweden: and though the grass in the inclosures be not at first of the choicest quality, it quickly improves, when sheep pasture in them for any time: and besides, they eat with great eagerness certain less noticed grasses, such as the *festuca ovina Linnæi*, which grow on the sharpest and most meagre hills. Trees of those kinds, which are apt to soil the wool, are generally destroyed in their pasture grounds; but shady, leafy trees are the more useful, as a scorching heat hurts the sheep more than cold, and even wet. For the most part too, the pasture grounds are situated so near the farm offices, that the sheep at the approach of a heavy rain may quickly be driven home; and in other places sheds are constructed to afford them shelter. In case of a continued rain, a careful sheep farmer also prefers foddering his sheep in the house, particularly soon after the shearing, when they are more delicate. Some persons fold their sheep all night on the summer fallow, for the sake of manuring it; but it is always better, for fear of bad weather and wild beasts, to drive them home every evening. If there is not running water, or good springs in the pasture ground, it is so much the more necessary to drive the sheep home, for the sake of watering them at the lakes or wells, which in this country are seldom wanting near the farm houses, because their disorders in the stomach, and worms in the intestines, mostly proceed from their drinking stagnated water.

For winter food, hay well got in on dry fields, or upland hay, is always chosen, and the greatest quantity of fodder ought to be at the rate of three marks a day for each sheep, reckoning the yearling lambs; this fodder (which should be measured out in baskets) for *seven months, during which time our sheep must be kept within doors*, makes thirty-one and a half stones (of 20 lbs.), or a good load of hay. When one meal is given of leaves, and another of the straw of spring corn or peas, from a third part, to the half of the hay, may be deducted. Of the leaf kind the sallow, the willow, the ozier, the maple (*acer plantanoides*), and the birch, are the best for feeding sheep. On the

other hand, inquiry is wanting how far the alder and the oak are inferior, and whether the aspen, which they so eagerly devour, is always hurtful, as our experienced cultivator, Charles Gustavus Boje, was inclined to maintain. Some persons, besides a sufficient quantity of hay, spend yearly from a quarter to half a barrel of oats on each sheep: but my breed has not altered, although they never have had this costly food. It is received as an incontrovertible truth, that the better sheep are fed with hay, the more surely, the breed is preserved in its primitive goodness; but experience is thought at the same time to prove, that well got spring corn straw, can pretty well supply the want of hay, when the sheep at the same time get a little refuse of corn and chaff. Other cultivators, on the flat grounds of Upland, who have but a small extent of grass land, have fed sheep with singular advantage on straw with grains, and thus derived an unknown profit from the distillery of spirits, which in other points of view, must be looked upon as the most destructive of all human inventions, and which was the principal cause that we, in the course of the last ten years, from 1781 to 1790, at an annual medium, imported 762,672 barrels of different kinds of corn.

Fodder is usually given out of racks; but it is necessary, that the hay be not put into them, when the sheep are in the house, and also that the bars be close, and stand quite upright, if we wish to prevent the wool from being soiled by the dust. I have also found, that the fodder may be strewed equally well on the floor, according to the peasant's method, by which means, the dust does not fall on the wool, neither is any thing left uneaten. Some persons let out their sheep to water only every third day in winter; but with me, they are let out to water, in the coldest season, with the greatest advantage, twice a day; by which means, they only drink moderately, and at the same time take a degree of exercise, which is requisite at all seasons. The thick woolled Spanish sheep must indeed feel less cold, than the thin woolled and more naked Swedish breed. The sheep houses may be aired and cleaned, while the sheep are out: the refuse of straw is by that opportunity spread on the floor, and over it new fodder. Towards spring it is useful to lay out twigs of pine and juniper in the farm yard, which serve in some degree for food, but still more as a remedy for the scurvy contracted during the winter; and there is no danger of the wool being deteriorated thereby, as some have pretended.

It is beyond contradiction, that the fineness of the wool in sheep, is principally derived from the nature of the race: that a coarse woolled species of sheep remains coarse and straight haired, though eating exactly the same food as another fine woolled

species, which on the contrary produces a fine and thick woolled offspring; that in the same countries, both colder and warmer, there are found both coarse and fine woolled sheep, without any particular change in the breed, if they do not happen to couple together. It must not, however, be denied, that a better and more suitable food improves the size of the sheep, their health and fatness, all of which may, in the long run, have an influence on the softness and the quantity of the wool. In the same manner experience proves, that a moderately warm climate is the most proper for sheep. In China, and the neighbouring hot countries of India, sheep are only used for food, and they are there only provided with very thin hair. Browne informs us, that European sheep, in the hot climate of Jamaica, had their tufty wool metamorphosed in the course of one or two years, into nearly goats' hair. On the contrary, the long legged sheep in the coldest climates, are covered with a rough and straight wool, under which there is found another fur, with a softer and more tufty wool, but under the belly, and on the inside of the thighs, they are mostly bare. That in the mean time, such sheep thrive better with severe cold, than others under the tropics, is proved by the instance of that country, so strongly discountenanced by nature, Iceland, which first began to be inhabited about nine centuries ago by fugitives, who sought there a sanctuary from the then tyrants of the North. That land is not now without numerous flocks of sheep, so that a single countryman is said to have from 500 to 1000 head, and the poorest at least sixty. They are also very easily maintained, as the sheep themselves for the most part seek for their own food, on the ground covered with snow; and those which live on the mountains, are said to be the fattest. These sheep are said to resemble much our Gothland breed; they have short tails, and the rams many horns. The sheep on Gothland, and the neighbouring islands, also go out the whole winter, and are noted for their incomparable fatness. This breed of sheep is also in proportion the most numerous, and their wool the best of the pristine Swedish native races, which last named still rather resemble the Gothlandish in shape, except that the ram's horns are very short.

To feed sheep constantly in the house, as the ancient Romans are said to have in part done, with a view to produce more wool on the Tarentine, or what were called the Grecian sheep, seems almost to be contrary to nature, and is at the same time extremely expensive. Yet the assertion of some, that housing sheep deteriorates the wool, and that their constantly remaining in the open air, and being led from one province to another, is the principal cause of the fineness of the Spanish wool, is

best cleared up and refuted by our method of uniformly feeding the sheep in the house from December, to the beginning of May, by which the wool loses nothing of its fineness. The house rams so common with us, which in towns are fed all the year round under cover, neither gain nor lose in fineness of wool, though it may be increased in quantity by a more abundant food. It is true, indeed, that the wool is generally fine, thick, soft, and short-tufty, on the Leonese and Castilian sheep, which in autumn are removed to Estremadura, in winter to Andalusia, in spring are brought back to New and Old Castile, and in summer to Leon; and thus the whole year round, wander about in the open air, except the day on which they are to be shorn; and on the contrary, that the wool is generally coarser and longer, or very like the Barbary wool in Andalusia and Estremadura, where the sheep constantly remain at home. The reason of this difference in the same country is principally to be found in the dissimilarity of the race of sheep; especially as it is demonstrable that not all the wandering sheep in Spain have the finest clothing wool, nor all those that remain at home the long hairy combing wool. It is granted, however, that the removing of the Leonese and Castilian sheep to and from the southern and more low-land provinces, where the pasture in winter is good, but in summer is burnt up by the strong heat, may contribute a great deal to the thriving of these creatures, and also to the abundance and softness of their wool. At the same time the English and Eiderstadtish sheep are not moved, and preserve their wool in an equal goodness, there not being the same reasons as in Spain, to make a removal necessary for them.

By our sheep being sheltered in the house in winter, all hurtful cold is prevented, as well as in Spain, where there is also no want of snow and frost upon the high grounds and mountains. In order to obtain a temperate warmth, double doors are in winter hung upon their houses, and air holes opened in the walls. In spring the sheep are always more delicate, and ought never to be let out in the morning before the frost be thawed, and the dew dried up. It is not less essential that they have a roomy and well situated house, since the most healthy sheep, like other living creatures, need a wholesome air, which, at the same time, they corrupt with their own breath. Thirty sheep require a house twenty feet square, and from eight to ten feet high, with a thick wainscoted ceiling. If the number of sheep that are put into a house is greater, six feet square are commonly reckoned for each sheep. It is usual also to separate the rams and the ewes of one and two years old from the older ones;

but according to my experience, fresh air and moderate warmth, are of more consequence than separating them according to age and sex.

Some owners of large stocks of sheep, particularly in the kingdom of Gothland, like the ancient Romans, and several sheep owners in those times, do not allow their sheep to couple before the third autumn. They keep them for this reason not only in separate houses, but also in separate inclosed pastures, and towards the end of October, cause them with much order and regular changes, to be covered in each house by rams chosen for that purpose, which are afterwards entirely separated from the sheep. It is perhaps possible, that a larger race may by this means in time be procured; but, besides that this order is very troublesome to the sheep-farmer, I am of opinion that it is contrary to free and simple nature. All animals pine, lose their appetite, if not their health, and at the same time couple afterwards with difficulty, if they do not get their desires satisfied in the strongest rut-season; and this must particularly be expected of sheep, which are naturally melancholic. My sheep have, perhaps more than most others, preserved the same fineness, bigness, good plight, and health, have seldom become barren, and never *cast* their young, notwithstanding that they were always allowed to couple whenever nature suggested it, which, however, seldom happened before the end of the second, or even in the course of the third year. And although there was at least one ram for each score of sheep, and consequently several of these creatures used to go together in the same pasture, they never hurt each other, when the sharpest horns were sawed off nearly to the quick; but the weakest always gave way to the strongest, and yet none of them failed in the open field, in getting an opportunity to satisfy their desires. When any old ram began to be too mischievous, he, together with other sheep set aside as being old, sickly, or less woolly, was killed in the autumn. It is highly necessary, that brisk and plump individuals be chosen for breeding rams: they ought to have a uniform white wool, particularly under the belly, on the legs, on the cheeks, and on the forehead. And they ought not to be allowed to be more than six or seven years old. The wool, indeed, keeps its fineness to the latest old age, though it may become somewhat shorter; but the race degenerates if the rams be too old. In the whole animal kingdom it appears, indeed, that the likeness in the progeny is the nearest to the parent that is the youngest, the strongest, or the most spirited, at the time of copulation; yet the Messrs. Alströmer, father and son, who have such great merit in furthering the propagation of the fine woolled breed of sheep in this country, have by various experi-

ments, both on sheep of the same race and cross breeds *(partus hybridus)*, confirmed the opinion among naturalists, that the likeness is generally derived from the father.

When nature has its free course, the greater part of the lambs are produced in this country within a fortnight before or after Christmas or the new year.* These early lambs are indeed, with us, a little more costly to maintain, than those that are dropped towards the spring; but they are also much stronger the ensuing autumn, provided the lamb and the dam be well taken care of during the first few weeks, and foddered with good hay, in separate divisions from the rest of the large stock of sheep. I also formerly, with a view to a supposed improvement of the breed, had the tails of the young ewes cut off, according to the Spanish practice; but a dairy maid who was offended at this unnatural mutilation, which in truth also long impedes the poor creature's walking, determined me to give it up: and experience has proved that the ewe does not find herself incommoded by her long tail, when the right rutting time arrives. When the lambs are dropped early, the dams are not so long weakened by it, after they get out into the pastures, and they drive their lambs from them at a more suitable time than we can point out. When the lambs are allowed to follow their dams too, they learn from them both to drink and to browse, which they otherwise cannot be brought to do without difficulty. They who, besides this, milk their sheep, do not long preserve the breed in equal perfection. In Spain itself the shepherds, it is said, do not milk the sheep, but carry goats with them along with the flocks, for the sake of milk.

Salt, to be sure, cannot, properly speaking, *generate* fine wool; but in as much as it increases appetite, and promotes warmth during rainy and cold weather, it may contribute to the thriving of the sheep. Different species of worms, but in particular liver worms *(fasciolæ hepaticæ)*, and leeches *(hirudines)*, dropsy, and the jaundice, are their most common distempers; and they are prevented and cured by means of that most favourite article, salt. In Spain, the wandering fine woolled sheep are said especially to get a great deal of salt when they are driven away from the winter pastures, but less at the other seasons of the year, unless there happens to be rainy weather. The good effects of salt may also be more quickly promoted by what are called lickings *(slekor)*, which are used in Sweden, consisting of salt, pulverized wormwood, and juniper berries, which are either given so, in a coarse powder, or made with tar into a thick broth, or electuary, which is given to the

* This is also said to be the usual lambing time in Spain.

sheep in a hollow fir trough, which stands in the middle of the sheep house, and over which branches of fir are nailed across, to prevent the sheep from soiling themselves with the broth. Others mix brimstone with this pottage, and make balls of it, which may be particularly suitable for such sheep as are subject to eruptions. Some persons also mix with it, tansy (*tanacetum vulgare*), bay berries, and garlic, as being good for worms, and the dropsy. Among the things which ought to be considered as both food and physic, hop tendrils and leaves deserve to be named, which the sheep eat after the hops are gathered, with the same eagerness that they do other bitter plants which are so wholesome for them.

The native Swedish sheep, which are either remarkably white, or black, as also the mixtures of the English, German, and Polish sheep, which either yield a straight combing wool, or a wool that has curly locks, are generally shorn twice in the year, without counting the coarsest hairy kind called *Lædja*. They otherwise are apt to cast their wool at the usual shearing season. This sort of wool is the most general in this country, though it is of very unequal goodness. Some persons from an immoderate zeal in favour of the fine tufted Spanish breed, have advised, that the peasantry should use that species, and that universally; but assuredly a long haired combing wool, especially from English and Eiderstadtish cross breeds, which are larger and more woolly, is the best suited, and most indispensable sort, for our Swedish independent peasants, holding of the crown, who possess above two-thirds of the kingdom; as well as for our peasants that hold of subjects, and for our cottagers. Their industrious women employ themselves during the long time that the earth is locked up in this country, with knitting stockings, weaving various woollen, or mixed linen and woollen stuffs, as also in many places home-spun and coarse cloths, both for themselves, and their husbands and children. The Spanish breed, with the finer clothing wool, is more profitable for gentlemen, who in this country for the most part, by means of their dependants, cultivate their own grounds. The Spanish breed is shorn only once a year.* In Spain the sheep are said to be shorn on their return from their winter pastures, at the beginning of May, in the neighbourhood of Segovia, and in the month of June, at Burgos, which is farther north. The greatest number of persons in this country, have also their shearing time a little before midsummer.

* It surely would be worth while to try clipping the Spanish breed in Sweden twice a year; where they are housed, it could be done without risk.

But as the weather is often still cool with us at that season, it has been found of late years the most advantageous to let that operation be performed in the month of July, after the meadows are mowed. The wool also grows the fastest in our country about midsummer, and it never falls off with me; neither is the heat often oppressive before the commencement of the dog-days.

Before the shearing, the wool with us is almost universally washed upon the sheep. Some persons wash their sheep in the open sea, or in running water, but this is never so clean, as when the sheep are first washed in a large tub, with one part clear lee, two parts luke-warm water; with a small quantity of urine; and then in another tub, with less lee in the water; after which the sheep are washed, laying them always on their back, with their heads up, in a tub with clean water; and lastly, there is poured on the sheep, standing on the ground, a sufficient quantity of water, which is as much as possible squeezed out of the wool. The sheep are afterwards driven into an unpastured adjoining meadow, and remain there (to prevent their soiling themselves in the sheep-house) a day and night, not only till they be dry, which in good dry weather happens within the third day, but also, if bad weather does not threaten, some days longer; so that the same grease, or *salve* as it is called, may again gather on the wool, which gives it a softer feel, and perhaps adds a little to the weight. Some persons wash their sheep twice, which I also once tried, but the wool became rougher in consequence of it, and in fact of a greyer appearance. The great quantity of grease which the finest Spanish wool contains at the first washing, mixes with the lee water, and makes it quite soft and soapy; but this grease is wanting in the second washing, so that the water is not in the least softened. If the first washing is well performed, the wool is by that means several per cent. cleaner than the foreign wool that is imported, which has not been washed after the shearing.

Others earnestly dissuade from washing the wool on the sheep, on the supposition that in consequence of their aversion to water, it must do them harm; which bad consequence, however, I for my part have never perceived. Sheep are not indeed used to swim; however I have seen house rams, that had taken an attachment to horses, rush after them across branches of lakes, so that hardly more of the body was visible than the head. In Spain it is said the wool is generally first shorn, and then soaked, stirred, and trampled for two hours in a tub with warm water. It is afterwards rinsed in running water, and laid wet in a heap, that the water may run off: and at last spread out on a meadow, that it may be well dried before it is packed into sacks.

The dirty wool is said to lose by this washing, from 50 to 55 per cent. in weight. Some proprietors of manufactures in Sweden, have adopted the following method of washing: they put the dirty wool into a cauf, with a great number of holes bored through it, which is placed in running water near the projection of a bridge, and fixed to it by means of a hinge at one corner. The chest thus fastened to the bridge can, by means of a crooked stick, be quickly pushed down into the water, in a circular direction, and drawn up again; by which means the water is alternately driven in and out, through the holes: after three days and three nights soaking, performed in this manner, together with repeated rinsings, the wool is said to become perfectly white and clear. If some persons in this country thus wash wool in different ways, there are others again, that do not wash it at all, but rather choose to take a lower price for their wool, which, however, must always be washed afterwards at the cloth manufactory. In home-spinning for the use of families, the washed combing wool is reckoned not to spin so well as the unwashed, which still retains its natural grease and clamminess; but the yarn must afterwards be well washed before it will take a die.

To mix different sorts of sheep for the sake of a breed, is quite common here in Sweden, so that the ancient race of the country, which produced a slight, thin, straight, and short haired wool, is now found among the peasants much mixed, particularly with the German curly species. These sheep are looked upon as more easily maintained, than the fine tufty Spanish breed; but according to what has come to my knowledge, the first mentioned consume as much as the last, and yet these are seen towards the spring going half naked: this, however, may perhaps proceed from the circumstance, that the houses in which sheep are most frequently put are too warm, and that they are for the most part fed with leaves, which dry (or heat) them too much: add to this, that the peasants seldom measure off the winter provision so exactly, that there is not something wanting, towards the spring. That the Spanish wool, at least with me, never falls off, is perhaps, besides, a more regular distribution of food, and a moderate warmth in the houses, to be ascribed in part, to the circumstance, that my sheep, which are clipped only once a year, are shorn late, after the cutting of the hay crop. The peasants reckon their sheep much more profitable, for this reason, that they lamb commonly a year earlier, often bring forth twins, and sometimes lamb twice a year, and consequently give more food to the owner; all which, on the contrary, happens less frequently with the Spanish fine woolled sheep; nor indeed is it wished by those, who are anxious about keeping up the breed. The tanned skins too

of Swedish and German sheep mixed, are affirmed to be stronger than those of the Spanish; but on the other hand, the skins of these last, with their thick tufty wool, have a great preference when they are prepared for furs and rough skins.

I doubt whether mixing European and Barbary sheep together, with a view, according to the idea of some, to procure a finer wool, would be advantageous. At least four large Algerine sheep, which I got some years ago as a present, as being an uncommon race, had a long and rather coarse combing wool, so that I thought it best to part with them. They had brown calf-like heads, with long ears, and that species of large broad tails which among the Jews made the fat of the offering, and which in Arabia and Egypt are said to weigh 20 lbs. and to require a small wheel-carriage to carry them. The oldest and finest Spanish race was very probably Syrian, which breed of sheep, both in former times and now, are known to be fine woolled; but if it is true, according to the assertion of others, that all Spanish sheep originate from Africa, it is at the same time likely, that they have been in part altered for the better under the climate of Spain, which has been further tempered by their yearly removal to a mountainous province, and, to one six or seven degrees more northerly, during the greatest heat of the summer. Those extensive navigators the Phœnicians, who had already established themselves in Cadiz above 1000 years before the birth of Christ, and who were afterwards strengthened by their descendants the Carthaginians, in New Carthage (Carthagena) and the adjacent places, probably laid the foundation for the Spanish race of sheep, with perhaps more than one breed; especially, as articles of trade and commerce were the chief object of all their usurpations. Strabo, who lived at the beginning of the first century, celebrates the goodness of the Spanish wool and cloth, with which a traffic was already carried on, at that time; although this author, who was himself a native of Amasia, extols most the black breed of sheep, which were in his own neighbourhood, in the environs of Laodicea in Phrygia. The great naturalist Pliny, who composed his history of the world towards the end of the first century, informs us that the Spanish sheep were at that time generally black; but in point of fineness, he assigns the first place to the Apulian sheep near Tarentum, as do also Varro, Columella, and Martial; which two last, being themselves born in Spain, must have been the best acquainted with the existing sheep of that country.

If an estate is not situated so near a large town, that milk can be disposed of there, or that hay may be sold, and at the same time dung be purchased at a small expence, it is certainly impossible to make more profit of hay than by maintaining

sheep, which in so great a measure both feed and clothe us. All other cattle which are maintained, beyond the most indispensable necessity, bring with them oftener loss than gain. The sheep, which in comparison with other animals, are bred up with so little difficulty, give us annually at least three marks of wool, if the race is Spanish and well kept; and besides this, a lamb, with a fleece of lamb wool, of one mark; all which put together, superabundantly compensates for its food. Such an early dropped lamb is by autumn nearly full grown, and will bring, when of a choice Spanish breed, at least two rix dollars, in specie. A year-old breeding ram of that kind is sold for three or four rix dollars, and one in its third year, for five or six rix dollars, in specie; which rams sometimes give the owner a much heavier produce of wool than the ewes. The wethers also pay for their food, by six or seven marks of yearly wool, and at the same time provide the family with a constant stock of savoury meat; for good veal often fails, and mutton has the additional good property, that it becomes more savoury with increasing age. A friend of mine at Strœmsholm,* who was furnished with my breed of sheep, which he has fed perfectly well, has had from one ram thirteen marks of unwashed wool. The wool, which he washed with great attention and rinsed from all dirt after it was shorn, was sold last year at 42 skillings, 8 *r.*; and it is believed that this year a full rix dollar may reasonably be asked for each mark. Wool may be transported from the most distant places with small expence. Neither is it the least advantage of sheep, that, when there is the prospect of a scarce hay year, their number may be diminished, and be easily restored to the full complement in two or three years; which certainly cannot take place with the slow-growing horned cattle. When there is proper pasture ground, and even where there is a sufficient provision of leaves, it must always be looked upon as an ill arranged establishment, if on a farm which produces ten good loads of hay, counting about thirty stone for each barrel's sowing,† there is not one-fifth part set aside for the sheep, and still more, all that exceeds that proportion. A pasture, which gives to a very few horses and horned cattle a scanty food, is yet sufficient, in great drought and the latest autumn, to maintain a pretty numerous flock of sheep.

People have been inclined for some years past to suppose that the Angora goats, from which the camels' hair, as it is called, is got, would not be less advantageous for

* The king's equerry, M. De Reuterstam.

† A Swedish barrel is not much different from a Scottish boll—wheat measure.

our cultivators, than the better breeds of sheep. The patriotic Sir Jonas Alstömer was the first who, in the year 1742, imported from Natolia, an Angora buck and a she-goat; the latter, however, died soon after her arrival. But the descendants of the buck with Swedish she-goats, are said, in the second and third generation, perfectly to resemble the Angora sire of that race. A Swede has also been sent out to acquire knowledge with regard to the management of this creature, and the spinning of the camels'-hair yarn. These goats are not so expensive to feed as sheep, but their annual fleeces are also much smaller; they are however more delicate, and somewhat more dainty than our Swedish goats, though at the same time they feed on trees of the needly species, and particularly the fresh shoots of the juniper. To keep their shining hair clean, there is a table placed in their house, on which the goats jump to amuse themselves. Besides the vicinity of Alsingsos, and some other spots in the neighbourhood of Stockholm, it is known that these Angora goats will thrive in the cold Dalecarlia, and in Finland, and also, that of their hair cloths have been wove, which do not yield in point of lustre to the noted *camelot de Bruxelles*. I, as well as several other householders, am provided with mixed breeds of Angora and Swedish goats, which have hair twice as long and smooth, as the common natives of the country. The hair of the bucks in particular is very bright and long; but for my part I have not as yet sold any of it, but have merely had very good carpets made of it for my own use. Though thirty goats, which are generally maintained at my farm during the winter, were short haired, and in general party-coloured, and had horns, yet the whole breed has in the space of eight years become white, long haired, and for the greatest part without horns, like the breed-buck I got, which was of a mixed Angora race. These get the same fodder as common goats, and are consequently the most easily maintained, of all domestic animals of the horned species. At a future time it will be more narrowly inquired into, how far the genuine Angora goats can in our climate preserve all the lustre, fineness, and softnes of hair, which they have in their native country, where, according to accounts, even sheep's wool has a resemblance of silk, more than of real wool.

[SWEDEN.]

XXXI. *Extract of a Letter from Baron* Schulz *de Schulzenheim, to the President of the Board of Agriculture, dated 3d November, 1796.*

I WILL now, Sir, have the honour of answering the questions you have been pleased to propose; first, *how far heath is with us found a proper food for sheep.*—Of heath I have little personal experience; it is the *erica vulgaris Linnæi*, and which is found in no great quantity in the fertile province of Upland, where I reside, and where at least nobody has recourse to it as food for sheep, when there is superfluity of pasture every where. In the mean time, to enable me to answer your question, I have corresponded with farmers in those parts of Sweden where there are fields of heath, and from them have learned, that considerable flocks of sheep can be supported on those outfields, where little else than heath is found, and that by burning it, provided care is taken, that a certain portion of it only is yearly burnt, and that so moderately, that the roots of the old heath are not destroyed. After this operation the young tender shoots afford pasture, not only to cattle and horses, but also to sheep. The burning is more easily performed in the spring, before the heath begins to grow, and when the fire in a calm day can be kept within certain bounds. But these heath fields are not so proper for Spanish sheep, yet they have flocks of that kind, and their pasture becomes improved by the *festuca ovina Linnæi*, which commonly comes up among the tender heath shoots, and is further encouraged by the powerful effects of sheep dung; since the bite of the sheep has the same effect on the young heath, as the gardener's scissars on different bushes, in promoting a multiplicity of new shoots. On the other hand those farmers, who at once burn off their whole field, to obtain a rich crop of corn from the ashes, subject themselves to a continual loss; for the barren red sand, of which these lands are generally composed, is incapable of producing repeated crops, and the sheep, as well as the bees, are deprived of their wonted food on heath. The loss in time is likewise more sensibly felt, in the deficiency of winter fodder, as the hay-crop in such places is generally scanty, and few leaf trees are found where heath grows; all sorts of leaves, properly dried, being otherwise used in Sweden as winter fodder for sheep. Such heaths have mostly succeeded

the former, burnt fir woods. All hope of the wood renewing itself disappears, when what little soil there was, is destroyed, whereas before, a few plants grew under protection of the heath, in such places which were secured from cattle. Such abuse has induced some to advise the interference of government, by prohibiting the burning of heath; but if an admonition, or a certain limitation, becomes necessary, a total prohibition would certainly be oppressive, because heath of two feet length, and a finger's thickness, is quite unserviceable for pasture, and at the same time smothers all other grass. In many parts of Germany, as Saxony, Brandenburg, and Pomerania, but especially Lunenburg, they lead their sheep out on the extensive heath commons; there the shepherd, with an instrument like the rake of an oven, clears away the snow, on the great field called Lüneburg-hayde, which consists only of turf moss, and barren heath hills. In Iceland the sheep generally are obliged to take this trouble themselves; but this attempt, when the snow is deep, often costs them their lives. Otherwise the snow tends to soften, and make the heath more palatable.

You next, Sir, are pleased to express a wish, to have *my remarks on the outlines of the proposed general report from the Board of Agriculture, on the subject of manures*. To Mr. Sommerville's treatise on that subject, you have given the modest name of a sketch, but in my opinion it is the most complete essay which has appeared any where in print, and needs therefore few additions or remarks. In Sweden, as in other countries, farmers have endeavoured to increase the quantity of manure, by mixtures of all kinds of vegetables and soils; and by collecting urine in cow-houses, well adapted for that purpose; they likewise in some parts of the country, lay below their cattle, water-fed earth, soil from the shores of the lakes, leaves, moss, saw-dust, chopped alder, and pitch fir, brushwood, reeds, and straw. They often now place their dunghills on a plane, instead of the former hollow, and by means of pumps, water them with urine and dung water. Many farmers, however, still prefer the fresh dung to that which is fermented, and which they suppose has lost, in the process, a great part of its vegetating power. They have now ceased to spoil the fine harbour of Stockholm, with nuisances of every kind. The contents of the privies are now collected by undertakers, in barrels, of which they are obliged to have a double quantity, to replace those deposited in the reservoirs, from whence they are carried to the country. My eldest son, who has changed the sword for the ploughshare, has particularly attended to this manure: being favourably situated on the lake Mälar, forty English miles from the capital, he conveys it in a convered boat, each loading of which, is suffi-

cient to dress about three acres of spring corn, and between four and five of winter corn, or meadow ground. This manure, by the motion of the boat, becomes more liquid, and is conveyed from the hold of the vessel by a bucket at the end of a lever, through a spout into a close cart on shore, drawn by two oxen. These carts are provided with a moveable funnel, and with a strainer, so regulated by means of a pole that the manure can be administered at pleasure by the driver, without further attention to spreading. That the land may not be overdunged, and the crop consequently lodged, care must be taken not to lay above forty such cart loads on the Swedish acre, for spring corn; each cart contains 180 gallons English, or lbs. 1920. The Swedish acre consists of 46,770$\frac{4}{7}$ square French feet, while the English acre contains only 38,285 ditto. After the first dressing, it is not advisable to sow more than a bushel of winter corn per acre, which generally produces six quarters. Spring corn is sown, in the common broadcast way, at most two bushels an acre, and which per medium generally give seven and a half quarters, or fifteen Swedish barrels. A Swedish barrel contains 7,386 French cubic inches, and therefore nearly the same with the English comb, or half quarter, which contains 7,204 ditto inches. Except that other powerful manure, produced by the herring oil-works' refuse, none can come into competition for richness with the contents of the privy, mixed with urine. The effects of this manure no doubt diminish gradually; yet its operation may be plainly perceived in the fourth successive crop. When clover is meant to be sown with spring corn, this species of manure is unsuitable; for although the seed be diminished to one-third, the straw becomes so thick and strong, as to choke the clover. In the outlines of the Chapter on Manures, a mixture of lime is recommended for this manure, in order to dry it, and correct the smell; but besides, that lime is not plentiful here, the process would be found to require a considerable time and expence. A little addition to the wages of the labourers, or cottagers, soon reconciles them to the inconvenience of the smell, and it becomes still less offensive to them, if they are allowed to use a part of it on their own little fields. If any particular impediment occurs, such as harvest work, this manure is then, from the vessel, conveyed to great pits, to be, after a mixture with other substances, driven to the field at a more convenient season.

The less fertile neighbourhood of Gottenburg, has of late years experienced a wonderful improvement, from the use of the refuse of herring oil-works; nor have they been deterred by its stench, infinitely more nauseous than the contents of the

privy. They have even found it worth while to drive it fifty or sixty English miles, which, in order to lessen the expence, they perform by large waggons, with friction-wheel bushes, drawn by six horses, guided by one driver. It is affirmed, that only ten barrels of 60 gallons, or 384 lbs. each, of this manure is required to one acre Swedish; at the same time it is diluted with water, sufficient to make it spread over the whole.

Top-dressing, so much recommended in England, has long been practised in Finland, and partly even in the province of Scany. After reading the intelligent writings you had the goodness to send me last spring, in default of other fermented dung, I top-dressed a couple of ridges of late sown and weak wheat, likewise another couple sown with rye, by a slight covering of street sweepings, which kind of manure is recommended as proper for the purpose. The ridges are comparatively improved, but far inferior to two weak barley ridges, which after the plants appeared, were thinly sprinkled with attenuated manure from the privy, and through which the straw became so luxuriant, as to resemble reeds. It appears to me, that this top-dressing might compose a part of the drill husbandry, now so much approved. I have lately imported from England, the Rev. Mr. James Cooke's drill machine, with the horse hoe, cultivator, and scarifiers belonging to it; and I have imbibed an advantageous opinion of that instrument, from Hall's Encyclopedia, revised by T. A. Lloyd (article, new system of Agriculture). Tull's, and also Du Hamel's sowing machine, improved by the late Count Cronstedt, have been long known here; but Mr. Cooke's invention, with its connected horse hoe, seems much preferable, and I long for the spring to be confirmed in my belief.

You have lastly been pleased, Sir, to interest me in supporting your *Proposal for an Agreement, amongst the powers of Europe, for the purpose of rewarding discoveries, tending to the general benefit of society*. This worthy and cosmopolitic proposition I have communicated to our Patriotic Society; but in the deranged state of our finances, in the latter years of Gustavus III. and since under our regency, there is little room for expectation. Had it arrived a little sooner, I had not neglected to lay this beneficial proposition before the Economical Committee, lately appointed by government, and of which I was a member; but that committee had already given its final deliberation. I am hopeful that our young king, who now commences his reign, and has shewn a disposition inclined to patriotism, will put a finishing hand to many proposed improvements, yet undecided.

[RUSSIA.]

XXXII. *Letter from Dr.* Guthrie *of St. Petersburg, to the President of the Board of Agriculture.*

SIR, Nov. 14th, 1793.

I was lately favoured with your letter, inclosing your speech on the opening of the Board of Agriculture, and a printed statement of the objects pointed out to those who are to make the proposed survey of your different counties. Duplicates of both these papers, I presented to the Economical Society of St. Petersburg, together with the letter addressed to it. The answer of that learned body will show the part they take in an institution which must, when seconded by the power and wisdom of the British government and legislature, far exceed, in its happy influence on Agriculture, every weaker effort of associated individuals, to promote national prosperity, by rural economy. For my own part I entertain the most sanguine hopes of its effects being as great, as the idea of such an establishment, reserved for our country and age, was splendid, and that it will in time do as much good, as it already does honour to Great Britain.

A short time before I was favoured with the abovementioned packet, I had taken the liberty of addressing to you some rude ideas through the medium of the Edinburgh journal, *the Bee*, which seems well calculated for throwing out such loose hints on economics, as are not sufficiently digested for direct presentation to so respectable an institution as that of the Board of Agriculture; but you will perceive that the principal object of that letter was to offer services (even before required) to so patriotic an institution, as that at which you preside.

The place of my residence must confine, of course, that offer to information from an empire richer in objects, than in the knowledge of useful culture; except your Board should turn its attention to the most northern parts of the British dominions, when possibly we might add to our hardy Siberian, Finish, and Swedish plants, a few remarks on northern agriculture, partly the result of ancient practice, partly of modern research, in hopes that they might assist in rendering the smaller British islands what Providence certainly intended them, a source of wealth and maritime power to the greater.

The Table sent you by the Economical Society, will shew what is actually raised at present in the lat. of 60, under local circumstances, which must ever vary with the soil, situation, &c. of a country, whilst the obstinacy, ignorance, and prejudices of the cultivators, are sometimes as difficult to vanquish, as even the physical obstacles that the enlightened farmer has to combat. I think it is not hazarding too much to say, that you will have several of those local circumstances in your favour, in cultivating the islands in question, particularly those of climate, and the superior intelligence of British subjects, over our slovenly obstinate Finish boors; a race of men much inferior in industry and in tractability to the Russians, as every proprietor in this province can testify.

The plan of the Russian Table seems equally well calculated to draw information from, and to convey instruction to, the different provinces of the empire, to which it is universally sent; as the most illiterate cultivator can fill up the blank spaces left for the purpose, under the article he raises, a very few words being all that are necessary, under the three following questions addressed to him.

1. In what kinds of soil are the seeds, &c. sown or planted in your province?
2. What is the time of sowing or planting them?
3. What is the time of reaping, with the average produce of the last five years?

A part of each of these columns is left blank, for the practical remarks of the Russian farmers, on the best manner of sowing, planting, and reaping the different vegetables they cultivate; on what is observed to be hurtful to them, with historic remarks on their agriculture. Such is the whole plan of the Table, which I have explained to satisfy curiosity, till your translator turns it into English; and shall only add, that the margin of it contains every plant used either for manufactures or domestic purposes, through the whole extent of the empire; although the answers given in it, are only relative to the agriculture of this province, given as a model for those from the others, which we expect in the course of a year. I am Sir,

with much respect for the Board, of whom abroad we form very high expectations,

Your most obedient humble Servant,

Imperial Corps of noble Cadets
in St. Petersburg.

MATHEW GUTHRIE.

[RUSSIA.]

XXXIII. *Tables containing Names of Plants, and Productions cultivated for domestic Economy, and for the Arts, in the District of St. Petersburg. Transmitted by the Free Economical Society of St. Petersburg to the President of the Board of Agriculture.*

The various plants and productions of nature mentioned in this paper have been more or less objects of general utility and necessity, from the mode of life adopted by the natives, or foreigners of the Russian empire.

Their utility and necessity also greatly depend on the climate and soil, which either assist, render difficult, or totally prevent their growth and improvement.

A desire in the inhabitants to ameliorate their situation, gave rise to the various experiments so frequently repeated, for the improvement of different productions used in domestic economy, and these experiments have enabled the inhabitants of different governments and districts to determine how far, at what time, and with what degree of profit, any plants or productions of nature might be cultivated, and have taught the people to proceed step by step in discovering, and establishing certain economical rules or principles of husbandry, as applicable to the cultivation of plants.

These rules determine the cultivation of any particular plant, whether it should be extensive or contracted, and merely to satisfy the inclination of the curious, or whether such plant should be rejected as totally useless or noxious to mankind.

If, after an accurate survey of each government or district, we could possibly attain a clear view or knowledge of such productions as are cultivated with success in each part of the empire, either for domestic use, and home consumption only, or in a commercial view, such survey or description of Russia would prove not only entertaining to every lover of economy, but also productive of general and essential service.

Thence it might be learned, what plants are cultivated to the greatest advantage, and in what part of the empire, and where they grow in quantities sufficient even for exportation; or on the contrary, where they are seldom or never cultivated; this

would excite an emulation in the inhabitants of the other governments, to try, if what has proved useful in one part of the empire, might not be introduced with success in another, particularly where climate, situation, and other circumstances should be found nearly similar. The people would also learn, that the introduction of any plant would prove equally unsuccessful in one place as in another, where the same mode of cultivation should be adopted.

In order to obtain the knowledge of all productions, and the modes of practice pursued through the whole extent of the Russian empire, and that such clear and comprehensive survey, with its consequences, observations, and instructions, might afterwards be communicated to all the lovers of economy, the Free Economical Society of St. Petersburg requests of N. N. that he will be pleased, for the good of the public, to employ an intelligent person to give proper information of all the different productions, the methods of practice now in use, and the good or ill success attending them in his neighbourhood.

As a view of each part of the country may be best exhibited on a table, the Society, in conformity with the proposal of their president, his Excellency Count Anhalt, have inclosed a Table containing their wishes and questions, which may easily be filled up on the spot by intelligent persons, even though from local circumstances those questions may regard not one only, but different districts, which resemble each other in general, or for the greatest part, in their productions. The difference of produce or practice, if any should be found, may be noted on the margin, and it may be specified in what district, and in what particular circumstance, that difference consists.

Besides the names of plants, there is in this Table:

1. A space to specify the surface of the ground, or a certain spot in a field, garden, &c. required by the abovementioned plants, &c. for their cultivation.

2. A space to shew the earliest or latest season of sowing or planting, on an average of the last five years.

3. A space to note the earliest or latest season of reaping, on an average of the last five years, and to shew the usual quantity of the produce.

4. The last space is made for observations and practical remarks or explanations; for example, what must be observed in the time of sowing, planting, or reaping; how such a production is to be used; what are the general causes of failure? or an historical explanation of the origin and progress of a plant, &c. If an observation should require more room than the space can allow, the remainder may be written

on a separate piece of paper, with references to the thing spoken of, by its name, number, &c. Such of the plants and other productions which are not cultivated in any part of the government or district are omitted, and the space remains blank.

The paper sent herewith as a specimen, will better explain the intentions of the Society. It is a description of the district of St. Petersburg, as a country lying towards the north, and is filled up by one of the proprietors of land in that part.

As the empire of Russia is very extensive, and contains a variety of climates, it is very probable that in some parts of it, there may be some plants, &c. used for food or other beneficial purposes, which are not mentioned in the paper, or are possibly unknown to the Society. It is therefore earnestly requested, that the persons who may be acquainted with such productions, would be pleased to give an exact description of them, their uses, and cultivation.

Different situations of the inhabitants of different climates, on spots of fruitful or barren land which they cultivate, have obliged them, particularly in time of the failure of crops, to invent various auxiliary means for their subsistence. The Society therefore requests the friends and promoters of this useful institution, to communicate such their discoveries; as amongst a variety of them, there may be found some of greater use than others, and some even may be found attended with dangerous effects.

By such information the Society will be enabled, and will endeavour to extend the knowledge of those auxiliary means which shall be found useful, as far as possible; and will give the necessary precautions against such as shall be found hurtful, and will in short offer their best advice how to procure such auxiliary means of subsistence as shall be found the wholesomest, the cheapest, and may be obtained in the easiest manner.

Farinaceous Plants.

No	Russian names, translated into English.	Latin.	Place of growth, and the soil.	Time of sowing and planting.	Time of harvest, and the produce.	Observations and Explanations.
1	Winter wheat	Triticum hybernum.	Upon lands sufficiently manured with dung.	In the latter end of August and the beginning of Sept.	About the middle of Aug. It produces 4 and 6 fold.	As there is but little soil in this district fit for sowing wheat, it is cultivated only by gentlemen, and that in small quantities; the peasants hardly ever sow it.
2	Spring wheat.	Triticum æstivum.	Upon rich land & where wood has been cleared off.	In the beginning of May.	About the middle of August. Produces 4 and 8 fold.	It is grown both by gentlemen and peasants; frequently suffers from early frosts, smut, and bad weeds.
3	Spelt.	Triticum spelta.	Not cultivated.			
4	Rye.	Secale hybernum. Secale multicaule.	In common lands, on the land cleared of wood, and in some places on the land where bogs have been drained.	The latter end of July, and the whole month of August.	The latter end of July, the beginning and middle of Aug. Produces differently from 3 to 35 fold upon drained bogs.	It constitutes the principal food for peasantry. The grain which is got from the lands cleared of wood, and from drained bogs, is generally smaller than that which grows upon common lands. It is frequently damaged in Autumn by worms, and in the spring by snow water, spring night frosts, mildew, and bad weather.
5	Spring rye.	Secale vernum.	Upon high and sandy ground.	In the beginning of May.	The latter end of Aug. Produces 3 and 5 fold.	Not cultivated in general.
6	Barley.	Hordeum vulgare.	On the best common and stony lands and where the wood has been cleared off.	In the beginning and middle of May.	About the middle of August. Produces 4 and 8 fold, and upon grubbed up lands sometimes 24 fold.	Sometimes it is damaged by smut, but more frequently by dry or wet weather, and by noxious weeds.
7	Double rowed barley.	Hordeum distichon.	Not cultivated.			
8	Naked or Egyptian barley.	Hordeum nudum cœleste.	Upon rich and upon stony lands.	In the beginning of May.	The latter end of Aug. Produces from 6 to 24 fold upon stony lands.	This is a most excellent plant. It is but lately introduced into cultivation; it ripens later than common barley, and is sown earlier. It frequently weighs as heavy as wheat, and is very proper for making grits. It suffers frequently from early night frosts, and from noxious weeds.
9	Winter, or six rowed barley.	Hordeum hexastichon	Not cultivated.			
10	Knotted, or large bearded barley.	Hordeum zeocriton.	Not cultivated.			

No	Russian names, translated into English.	Latin.	Place of growth, and the soil.	Time of sowing and planting.	Time of harvest, and the produce.	Observations and Explanations.
11	Common or white oats.	Avena sativa alba.	On common & newly broke up lands.	At the latter end of April, and the beginning of May.	From the middle of Aug. to the beginning of Sept. Produces from 3 to 8 fold.	They are generally sown upon poorer land than barley. If sown late, and near woods or damp places, they are frequently damaged by early spring frosts, by bad weather, and noxious weeds. Some husbandmen have tried rolling the barley as well as oats, to keep the ground from drying so soon.
12	Black oats.	Avena nigra	As the above	The same as white oats.	Ditto.	Although they yield better than the white oats, yet the grain is smaller and thinner; however, in some places they are found to weigh heavier, and produce more flour.
13	Buck wheat.	Polygonum fagopyrum.	Upon high sandy, light lands.	In the month of May.	In the beginning and the middle of Sept. Produces from 10 to 15 fold.	Suffers very frequently from the frosts. It is used by the peasantry for making grits, bread, and different sorts of pastry.
14	Siberian buck wheat.	Polygonum tataricum.	Although it be not hitherto brought into the common cultivation, yet some experiments have been made by the curious, in small quantities, from seeds distributed by the Economical Society.			
15	Maize or Turkish wheat	Zea mays.	Not in general use, except in some few garden-grounds, the climate being too cold for it.			
16	Rice.	Oryza sativa	Not cultivated.			
17	Millet.	Panicum miliaceum.	Not cultivated, except in a few garden grounds.			
18	Italian millet	Panicum Italicum.	Not cultivated.			
19	Bucharian millet.	Holcus sorgum.	Not cultivated.			
20	Float fescue.	Festuca fluitans.	Not cultivated here, although it grows spontaneously upon meadows which are sometimes overflowed; but no use is made of it.			

Oleaginous Seeds.

1	Sesame.	Sesamum orientale.	Hitherto it has been unknown, but this year some experiments have been made at the recommendation of the society, and it yields a very fine oil.			
2	Poppy.	Papaver orientale.	Not cultivated.			
3	White mustard.	Sinapis alba	Cultivated only in a few garden-grounds.			
4	Black mustard.	Sinapis nigra.	Cultivated only as above.			
5	Cameline.	Myagrum sativum.	Not cultivated.			
6	Rape.	Brassica napus.	Not cultivated.			

Pulse, or Siliqueous Grain.

No	Russian names, translated into English.	Latin.	Place of growth, and the soil.	Time of sowing and planting.	Time of harvest, and the produce.	Observations and Explanations.
1	White peas.	Pisum sativum album.	On rich land.	In the beginning of May.	At the latter end of August. Produces 4 and 10 fold.	The peasants sow but few of them. They are damaged by weeds and bad weather, and sometimes by frost. Some have tried to sow them after paring and burning the surface, and have had very good crops.
2	Grey Peas.	Pisum sativum nigrum	Ditto.	Ditto.	Ditto.	They are more generally cultivated than the white pea, on account of their being hardier.
3	Beans.	Vicia faba	Require rich land.	In the beginning of May.	In the middle of Aug. Produce from 10 to 15 fold.	They must be well hoed and cleaned if a good crop be expected. The inhabitants of Finland make use of them for their common food, as well as peas, turnips, and cabbage.
4	French beans.	Phaseolus vulgaris.	In the gardens in towns and villages. They frequently suffer from frosts.			
5	Tares.	Vicia sativa.	Not cultivated.			
6	Lentils.	Ervum lens.	Upon well manured light lands.	In the middle of May.	In the middle of Aug. Produces from 4 to 6 fold.	They are only sown for gentlemen's use. They are damaged sometimes by frost and noxious weeds.
7	Vetches.	Cicer arictivum.	Not cultivated.			

Esculent Roots.

1	Beet root.	Beta vulgaris.	In gardens, as early as the ground can be got ready for it.			
2	White beet-root.	Beta alba.	Only in some gardens.			
3	Parsnips.	Pastinaca sativa.	In gardens.			
4	Carrots.	Dauca carota.	Every where in the gardens, and amongst common peasants.			
5	Onions.	Allium cepa	Ditto.			
6	Garlick.	Allium sativum.	Ditto. - - -			Some peasants cultivate it for the market.
7	Horse radish.	Cochlearia armoracea.	Ditto.			
8	Radishes.	Raphanus sativa.	Common in peasants' gardens. -			Some have sown them after paring and burning the surface.
9	Turnips.	Brassica rapa.	In gardens, and after paring and burning.	In the middle of June.	At the latter end of September.	The Finland turnips are exceedingly sweet and firm, and keep remarkably well through the winter in wells or holes dug in the earth. The inhabitants of Finland sell a vast quantity of them in the capital, of the small kind, sown very early in the spring.

No	Russian names, translated into English.	Latin.	Place of growth, and the soil.	Time of sowing and planting.	Time of harvest, and the produce.	Observations and Explanations.
10	Turnip-rooted cabbage.	Brassica napus.	In garden-grounds.			
11	Potatoes.	Solanum tuberosum.	In gardens, and by some gentlemen in common fields.	At the latter end of April and the beginning of May.	At the latter end of September.	Their produce is twenty fold or more; they succeed almost every year. It is only within these few years that they began to introduce them. The market of the capital is chiefly supplied by the German colonists and gardeners.
12	——	Helianthus tuberosus.	Only in some gardens.			
13	——	Brassica napo-brassica.	In general cultivation amongst peasantry for home use and for the market.			
14	——	Brassica gongyloides	In gentlemen's gardens.			Several people have tried to cultivate them, and they seem to succeed very well, particularly after burning the surface; but they will not keep in wells, or holes dug in the ground like the Finn turnip; they soon become porous, are not so firm, nor so sweet flavoured.
15	English turnips.	Brassica rapa Anglicana.	In gardens, grubbed up lands, and after paring and burning, and on drained swamps.	In the middle of June.	At the latter end of September.	

Different Vegetables.

1	Green cabbage, or savoy.	Brassica oleracea viridis	In the gardens near the capital.			
2	Brown cole.	Brassica laciniata rubra	In gardens near the capital, where there is a ready market for it; as well as in gentlemen's gardens.			
3	White, or sugar-loaf cabbage.	Brassica capitata alba.	In gardens, and after burning the surface.	They are sown very early, and transplanted about the middle of June.	At the latter end of September.	They are cultivated in general for home use, as well as for the market. For peasantry this is one of the principal vegetables.
4	Red-loaf cabbage.	Brassica capitata rubra.	In gentlemen's gardens.			
5	Asparagus.	Asparagus officinalis.	Common in different gardens.			
6	Lettuce.	Lactuca sativa.	In gardens.	It is sown early in hot-beds, and in the summer in open air, it is cultivated in great quantity near the capital, both for home use and for the market.		
7	——	Atriplex hortensis.	In gardens.			
8	Spinage.	Spinacia oleracea.	In gardens, in the same manner as lettuce.			
9	——	Allium scorodoprasum.	In gardens.	It is sown late in the autumn, that it may come up in the spring, which it does very early; the leaves of it are cut repeatedly for use in the course of the summer.		
10	——	Allium schoenoprasum.	In gardens.	In some grounds it grows spontaneously every year, and is frequently cut for use.		

Garden Growth, or Fruit.

No	Russian names, translated into English.	Latin.	Place of growth, and the soil.	Time of sowing and planting.	Time of harvest, and the produce.	Observations and Explanations.
1	Gourds.	Cucurbita pepo.	In gardens.	Chiefly near the capital.		
2	Water melons.	Cucurbita citrullus.	In common as well as gentlemen's gardens; in hot-beds, and under the cover of glasses.			
3	Flask gourd.	Cucurbita lagenaria.	Not cultivated.			
4	Melons.	Cucumis melo.	In hot-beds and under glass, every where about towns, &c.			
5	Cucumbers.	Cucumis sativa.	They are sown early in the spring in hot-beds, and hot-houses, and in the open air when the weather begins to grow warm; they continue till the autumn.			They are sown in great quantities in the capital and the environs, and by the peasants, both for their own use and the market; but the Finns do not cultivate them.

Fruit Trees.

1	Apple.	Pirus malus.	In gardens, orchards, &c. near towns, and in the country amongst gentlemen, as well as common peasants.			
2	Pears.	Pirus communis.	Only in a few gardens at St. Petersburg, where they are sheltered from the north winds and frosts. They bring no fruit unless assisted by artificial warmth.			
3	Peaches.	Amygdalus Persica.	Only in hot-houses.			
4	Apricots.	Prunus Armeniaca.	Ditto.			
5	Plums.	Prunus communis.	Ditto.			
6	——	Prunus domestica.	Not cultivated.			
7	Cherries.	Prunus cerasus.	In gardens both belonging to gentlemen and common peasants.			
8	Walnuts.	Juglans regia.	Not cultivated.			
9	Almonds.	Amygdalus communis.	Ditto.			
10	Chesnuts.	Fagus castanea.	Ditto.			
11	Figs.	Ficus carica.	In some gardens, where they can be put into hot-houses in the winter.			
12	Olives.	Olea Europæa.	Not cultivated here.			

Artificial Grasses.

1	Sainfoin.	Hedysarum onobrychis.	Not cultivated here.			
2	Red clover.	Trifolium pratense rubrum.	Upon rich lands.	It is sown with barley and oats.	The first crop is cut about the end of June, and the second in September.	A great quantity of it grows wild. Some gentlemen have tried to cultivate it, but without much success, on account of the early frosts which destroy it; but when it does succeed it may be cut twice, and upon very rich land or gardens, thrice.

No	Russian names, translated into English.	Latin.	Place of growth, and the soil.	Time of sowing and planting.	Time of harvest, and the produce.	Observations and Explanations.
3	White clover.	Trifolium pratense album.	Not cultivated here. Some years it grows wild in great quantity upon dry meadows and common fields; it is not cultivated, because it is much smaller than the red clover, and consequently not so profitable.			
4	Lucerne.	Medicago sativa.	It is not cultivated here at present, but merely for the sake of experiments in some gardens.			Some experiments have been made to grow it here, but it has not succeeded, because its root going deep into the ground, it requires very deep, dry, and rich mould.
5	Swedish trefoil	Medicago falcata.	Is not cultivated; but some experiments lately made, shew that it stands our winter much better than Lucerne.			
6	Rye-grass.	Lolium perenne.	Not cultivated. It grows wild in abundance.			
			Plants used in the Arts and Domestic Economy.			
1	Hemp.	Cannabis sativa.	In the richest soil.	In the middle of May.	At the latter end of Aug. & begin. of Sept.	It is cultivated here by peasantry merely for their own use.
2	Flax.	Linum usitatissimum.	On the richest and the newly broken up land	In the beginning of June.	In the middle of August.	It succeeds here very well, but is cultivated chiefly for home use.
3	Mountain, or wild Siberian flax.	Linum perenne.	Not cultivated.			
4	Tobacco.	Necotiana tabacum.	Cultivated merely for the sake of curiosity in some gardens.			
5	Teazle or fullers thistle.	Dipsacus fullonum.	Ditto.			
6	Madder.	Rubia tinctorum.	Not cultivated.			
7	Woad.	Isatis tinctoria.	Ditto.			
8	——	Reseda luteola.	Ditto.			
9	Saffron.	Crocus sativa.	Ditto.			
10	——	Croton tinctorium.	Not cultivated.			
11	——	Rhus cotinus.	Unknown; and is only found in the botanic garden at St. Petersburg.			
12	——	Carthamus tinctorius.	Ditto.			
13	——	Capsicum annuum.	Not cultivated.			
14	Mulberry.	Morus alba.	Ditto.			
15	Black mulberry.	Morus nigra	Not cultivated.			
16	Tatarian mulberry.	Morus tatarica.	Ditto.			
17	——	Asclepias Syriaca.	Found only in the botanic gardens at St. Petersburg.			

No	Russian names, translated into English.	Latin.	Place of growth, and the soil.	Time of sowing and planting.	Time of harvest, and the produce.	Observations and Explanations.
18	Cotton plant.	Gossipium herbaceum.	Not cultivated.			
19	——	Salicornia et salsolæ species.	Ditto.			
20	Sumach.	Rhus coriaria.	Ditto.			
21	Hops.	Humulus lupulus.	In different garden-grounds.		At the latter end of Sept.	They grow wild likewise. Some gentlemen, and a good many peasants, have their own hop-grounds, but they grow them chiefly for home use.
22	Vine.	Vitis vinifera.	It is cultivated only in some hot-houses at St. Petersburg.			

Trees and Shrubs used for making hedges, poles, hurdles, &c.

1	Willow or osier	Salix.	It is not planted, but grows spontaneously in vast quantities near rivers and boggy lands.	The bark is peeled off in the spring, dried, ground, and sold to tanners at St. Petersburg.
2	Poplar.	Populus alba.	Unknown here.	
3	Lombardy poplar.	Populus italica.	Unknown here.	
4	——	Lonicera caprifolium.	Only in some hot-houses.	
5	——	Syringa vulgaris.	It grows here in gardens remarkably well, is very fit for making espaliers, particularly as its leaves are very seldom affected by insects.	
6	——	Spiræa salicifolia.	In gardens.	
7	——	Robinia caragana.	In some gardens it grows in plenty; it requires middling soil, and never suffers here from cold, and is very fit for espaliers, because its leaves do not suffer from insects.	

Observations on different Plants cultivated by the Husbandmen of the District of St. Petersburg.

Rye bread, as every body knows, is the chief support of this district, as well as of the other northern parts of Russia; but in order to save the rye flour, and to make it last the longer, the inhabitants, when compelled by necessity, mix with it fine ground oatmeal, the meal of buck-wheat, and the husks of the field mustard-seed (*sinapis arvensis*). The produce of rye in very few places varies more than here. The poor sandy lands will hardly produce more than three times the quantity sown; the middling sorts of land produce four and six times the seed. The rich or well manured lands, and such where wood has been cleared off, will produce in a good season ten or twelve, for one sown; but the most extraordinary produce is that which is gathered from boggy lands, drained and sown with rye, as in a favourable season it increases forty times and upwards. The reason of this extraordinary increase must be explained; it is owing to the ashes produced by burning the bogs, which assist the vegetation to that degree, that frequently they find one grain produce forty plants, and even more; for this reason they generally use a much smaller quantity of seed in sowing such lands. There is no reason to sow clump-rye (*secale multicaule*) upon such lands, as any good common seed increases very much upon so rich a soil, to which the burning of the surface has added so much of the vegetative power.

Of the spring corn, oats undoubtedly are the most productive; they grow well upon middling sort of land, and in general are attended with good success. It happens however, that if sown late, and particularly on lands, on which the wood has been grubbed up, or on such as are surrounded by marshes or woods, or lie too flat; in that case the crop does not sufficiently ripen, and is damaged by frost; they are obliged therefore to sow oats very early, so much so, that sometimes they are put into the ground when the snow is hardly off it, and are then ploughed in.

The peasants of this district are not fond of selling their rye or barley. If they have more than necessary for the use of their families, they prefer lending it to their poorer neighbours, upon condition that they should repay them with work in the seasons of hay or harvest. The produce chiefly carried to market, consists of oats, hay, straw, turnips grown upon grubbed up lands, which are greedily bought up, with different other garden vegetables, and potatoes, which have been lately brought

to market. They sell likewise a great quantity of wood, charcoal, bark for tanners, butter, milk, lambs, calves, pigs, eggs, various kinds of berries, &c.

Barley is sown but in a small quantity, because the peasantry in general have but a small quantity of land, and very few cattle for making dung; their hay and straw generally fetches a very good price at St. Petersburg. They like much to sow their corn and garden vegetables upon grubbed up lands, and after paring and burning.

More oats are sown than barley, or any other spring corn, because they do not require such good land as barley does, and are not so soon damaged by weeds or bad weather.

The district of St. Petersburg, which in length extends to the north along the great road leading to Keks-holm 67 versts,* and to the north-west, along the road leading to Wyburg, 46 versts, and in its utmost breadth, viz. beginning from the gulf of Cronstadt to the district of Slüsselburg, contains about 40 versts, mostly consists of woods, bogs, and small lakes; and the ground, which chiefly is sandy and full of small hillocks, is continually intersected by lakes or bogs, which are the cause that the agriculture here at present is in a very indifferent state; it is to be hoped, however, that in a few years it will be much improved, and the arable land will increase considerably, as they have begun already to drain a great many bogs, which in time becoming dry, will render the climate milder, by removing, or at least lessening in some degree, the damps, with all their bad consequences.

Although some of the peasants of this, as well as other districts in the government of St. Petersburg, do not, some years, grow a sufficient quantity of corn for their maintenance, yet they are never under the necessity of mixing their flour with any other adventitious mixture, such as the bark of trees, &c. because, being near Petersburg, they find various employments; for instance, they do different works in warehouses, sell, as I mentioned before, hay, wood, charcoal, tanners bark, butter, milk, cream, calves, lambs, pigs, variety of game, and domestic poultry, fish, cray-fish, berries, mushrooms, brooms, &c. &c. They also carry by water to St. Petersburg different kinds of stone, lime, sand, moss, reeds, rushes, &c. and by these and other such like works, they earn money enough to procure whatever is necessary for the support of their families.

* Versta is the usual measure of roads in Russia,—one thousand one hundred and sixty-six yards and two feet.

[RUSSIA.]

XXXIV. *Answers of the Imperial Free Economic Society of St. Petersburg to the Queries of the Board of Agriculture.*

QUERY 1. *Which are the trees and plants that resist best the climate, on the sea coasts of Russia?*

Answer. The trees growing on the borders of the Sinus Finnici, and the White and Ice seas, are in regard of their great quantity of the following order:

Pinus silvestris, pinus abies, betula alba, betula alnus, populus tremula; different salices, *juniperus communis, sorbus aucuparia, prunus padus, rhamnus frugula, quercus robur, tilia Europæa, pyrus malus, acer campestre, fraxinus excelsior, ulmus campestris, pinus picea, pinus larix, pinus cimbra, pinus rubra Milleri.* These last four grow on the coasts of the White, and the Ice seas.

Plants.—Different salices, *viburnum opulus, corylus avellana, rosa canina, betula nana, daphne mesereum, ribes nigrum, ribes rubrum, rubus idæus, rubus fructicosus, erica vulgaris, lonicera xylosteum, myrica gale, ledum palustre, arbutus uva ursi, andromeda calyculata, vaccinium uliginosum.* On the borders of the Ice sea are, *salix reticulata, salix inculacea, arbutus alpinus, andromeda tetragona, dispensia lapponica, azulea procumbens, andromeda cærulea, hypnoides, &c. &c.* If the names of the plants of this country are pointed out to us (which may be found in Pallas's Flora Russica, Gorler's Flora Ingrica, and Linnæi Flora Suecica) which grow in the coldest parts of this empire, if the seeds are wanted, they shall with pleasure be provided and sent.

Q. 2. *What is the most convenient method in Russia to clean and separate buck-wheat from its husk?*

Ans. Buck-wheat is ground generally into grits by means of handmills, or lever hammers, and is made either coarse or fine. The coarse sort is used for gruel, and the fine sort for cakes and biscuits. In some places they even make use of the first grinding with the bran, more or less, in addition to the finer flour, for baking household bread. It also serves to fatten hogs or poultry in a short time.

The principal method to cleanse and separate the husk is, to pour boiling water on a given quantity of cleaned buck-wheat, to stir the mass about with a stick, and draw the water off, then to pour cold water upon it, having first stirred it about well. In a quarter of an hour after, the buck-wheat is taken out with the hands, and the water squeezed out. In the summer it is dried in the sunshine, and in winter in a warm room, and spread on the floor. As soon as it is quite dry, it is ground in a handmill or a stamping machine into grits, in which state it is very clean and tasteful. The flour obtained from the sieve is dainty, and very fit for cakes, &c.

Q. 3. *Information is requested concerning the sort of turnips peculiar to the soil of Moscow?*

Ans. The turnips that grow in Finland are preferable in point of sweetness and firmness to those in Russia, and may be preserved in cellars until the spring following. They are sown on lands cleared of weeds by fire, or on ground that has had wood ashes strewed over it. If dung is thrown on, it deprives them of their sweet taste, and renders them bitter.

Q. 4. *What are the crops, roots, or seeds from whence brandy is distilled in Russia?*

Ans. Brandy is in general distilled in Russia from rye meal, with a more or less additional quantity of barley, oatmeal, and barley malt; but very seldom from wheat, or buck-wheat.

They also distil brandy from potatoes, juniper berries, and *sorbus aucuparia*, at all times with an addition of meal and malt.

They distil in Astrakan a sort of French brandy from damaged wines, prunes, kernels of cherry-stones, and wild almonds, *amygdalus nava*. Some of our distillers make use of the skin and stalks of pressed grapes, raisins, and the waste in sugar refineries, with which they make good brandy. To the worst and common sorts of brandy belongs the dram at Kamtschatka, of *heracleum sphondylium*, and another used by the Kalmucks, made from sour distilled mares' milk, which is spirituous, but rather of a disagreeable flavour.

Q. 5. *In distilling brandy from rye, what measure or weight of this grain is necessary to produce its portion of spirit?*

Ans. In good distilleries, the Russian weight named *ischetwerk*, weighing from 320 to 350 lbs. the rye being more or less heavy, will produce about 160 lbs. ordinary brandy.

Q. 6. *What is the price of rye, and the value of the brandy?*

Ans. The price of rye differs in several provinces; it is now in St. Petersburg seven rubles per *ischetwerk.* Brandy is sold at the imperial magazines at four rubles per *vedro* of 32 lbs. The reason of its being so dear, is on account of its being a monopoly belonging to the crown.

Q. 7. *What animals, whether hogs or others, are fed from the refuse of the above distilleries, and what profit ensues therefrom?*

Ans. The refuse in question commonly serves to feed oxen, as well as hogs. The butchers give for a quantity sufficient for the food of a large Ukraine ox, for four or five months, from twelve to fifteen rubles, hay inclusive, &c. &c.

Q. 8. *Are there any cattle in Russia remarkable for their carcass, or for the quality of their milk?*

Ans. Near the town of Kolmogorod, not far from Archangel, there are beautiful large cows, which differ but little from the Dutch cows. In Lapland and Samojedien they milk the rein-deer.

[RUSSIA.]

XXXV. *Translation of a Letter from Count* Alexis Orlow Chesminskoy, *to the Rev. Mr.* Smirnove, *a Foreign Honorary Member of the Board of Agriculture.*

SIR,

YOUR letter, dated the first of November, 1794, and the inclosed copy of Sir John Sinclair's, I had the pleasure to receive in due time, for which I return you my thanks. You make an apology for giving me the trouble in consequence of the letter which Sir John Sinclair wrote to you; to this I will tell you, that your compliance in executing his commission does you honour, as a member of the Board, and to me it gives not the smallest trouble. In regard to the questions asked, although I am very fond of economical pursuits, yet feeling much the want of a sufficient knowledge of them, my answers shall be short.

In his journey through Moscow, Sir John Sinclair afforded me the pleasure of his acquaintance. We conversed then upon a variety of subjects; but as I am not much conversant either with the English or French languages, nor was Sir John then either in the Italian or German, it is possible that a mistake might have happened in the meaning of some expressions, concerning the management of horses, as we used to talk a great deal of them.

I recollect well having related to Sir John, that our common horses, as well as those of the Cosacks, which are reared in the deserts, suffer an amazing degree of cold, want of food, and other hardships, with surprising patience, and that they can take their rest, although there is no straw under them, without any inconvenience; but that all our other horses are treated with more tenderness.

Our stables and stalls are built in the same manner as those of other countries, but we do not manage our horses as they do in England, where I understand that in general they have their litter under them continually: but we give them straw in the evening, and in the morning take it away. Likewise those who are fond of horses do not keep them in very warm stables during the severity of the winter, in order, when they go out, that they may not be liable to catch cold so easily.

I have been favoured with several letters from Sir John Sinclair; with the last I

received a book, and a drawing of a ram; in it, he expresses a wish to know the different breeds of our sheep; I acknowledge myself very guilty in not having hitherto sent him an answer. I beg of you to make my best excuses, and assure him that it is to me a very great satisfaction to have a share in his valuable friendship; that I return him thanks for all his attentions, and entertain a perfect regard and esteem for his having undertaken a plan so salutary and so useful to mankind, the fruits of which are by far the most advantageous of any that we can procure from the bowels of the earth.

To satisfy his curiosity about sheep, pray tell him that those of Great Russia are of little value; they are small, and their wool is rough. Those of the Ukraine and Little Russia are better, larger, and their wool longer and somewhat softer: they are of different colours, in some places white, and in others black. We have a great many brought from Silesia, and a few from Spain. Those which were bred here from the Spanish, although their wool be softer even than that got from the native ones, yet it differs widely from the true Spanish. We have a particular breed of rams from Crimea, whose skins are chiefly made use of by the nobility for their winter caps, trimmings and linings of their pellices, &c. &c. Amongst the Kalmucks, in their hordes about Ozenburg, there is a kind of very large rams, they are chiefly of a dark greyish colour; their wool is very long and rough, but their meat is delicate. On the hind part of their body, that is about the rump, they have from 20 to 40 pounds of fat, and this fat is different from the common sort; it resembles more the meat of the cow's udder. This is all I know of sheep; and if Sir John should wish to have any or all the abovementioned sorts of rams sent him, I shall undertake the commission with pleasure.* I am, &c. &c.

COUNT ALEXIS ORLOW CHESMINSKOY.

Moscow,
January, $\frac{11}{22}$, 1795.

* Specimens of these kinds of sheep have since been sent to England by Count Orlow, and have thriven well. This respectable branch of the Orlow family is called *Chesminskoy*, in consequence of his having destroyed the Turkish fleet at the famous battle of Chesmé.

[SWITZERLAND.]

XXXVI. *Extract of a Letter from Mr.* Kirchberguen *de Liebistorf, President of the Economical Society at Berne, to the President of the Board of Agriculture; dated Berne, 5th February,* 1796.

It is with the greatest satisfaction, that the Society observes the progress of an institution, already so advantageously known by the public newspapers, and other sources by which we are made acquainted with English literature and transactions.

The idea of a Board of Agriculture, such as has been formed on the present occasion, does as much honour to those who originally planned it, as it does to the government by whom it was adopted, and the Sovereign who favoured it with his protection.

There is no doubt that such an institution, directed by knowledge and activity, and supported by those means which the opulence of a great nation, and the liberality of an enlightened parliament can furnish, will soon produce the happiest effects, not only in favour of British agriculture, and the prosperity of your nation; but it must also prove in the highest degree beneficial to other countries, who will profit of its success, or imitate its example.

The *Plan of an Agreement amongst all the Powers of Europe, and the United States of America*, in favour of those who are the authors of new and useful discoveries, indicates a nation long habituated to great ideas of public and practical utility. The execution of such a plan would furnish to the friends of genius and science resources long wanted, and would lay open to the European states, a degree of happiness, of which it is impossible to calculate the extent, or trace even the progress.

The Society enters with all the zeal imaginable into so splendid a design, and will give it all the support which it has the means of furnishing. It is anxious, therefore, to know by what means it can best contribute to carry so important a measure into effect.

[ITALY.]

XXXVII. *Translation of a Letter from the Prince de* Castelcicala; *written by command of his Majesty the King of Naples, to the President of the Board of Agriculture.*

SIR, Caserla, 21st April, 1795.

I DID not fail, soon after my arrival here, to inform his Sicilian Majesty of the desire you expressed to establish a correspondence with this country for the improvement of Agriculture in general, and that of sheep in particular. The King my master, who at his leisure hours employs much of his time and personal attention in these objects, so important to the prosperity and to the welfare of his subjects, has commanded me to write to you, that he shall be glad to see such a correspondence established, being fully convinced that it must contribute infinitely to the progress of such improvements in his dominions. You will please, Sir, to point out to me, the basis on which the Board of Agriculture may think proper that such a correspondence should be established, and you may be assured, that on our part we shall shew all possible zeal and attention. In the mean time, his Majesty is desirous of having a few specimens of the finest English wool, in its raw state, in order to compare it with the best sorts of our own wool, and we shall acquaint you with the difference we discover therein. I have the honour to be, &c. &c.

LE PRINCE DE CATELCICALA.

☞ The war, which has unfortunately raged over so large a portion of Europe, has prevented that intercourse between the Board of Agriculture and foreign nations, which would have been so interesting and so instructive to all. But the above, and other letters printed in this Part of the Volume, sufficiently prove how anxious not only the people, but the sovereigns, of other countries are to assist the extensive views with which the Board of Agriculture was established, and how deeply impressed they are with an opinion, that such an institution is not only likely to promote the improvement of Great Britain, but also that of every other country. Indeed, one of the directors of the hostile government of France (M. Barthelemy), has taken an opportunity of stating to the President of the Board of Agriculture, how anxious he is to see the moment arrive, "*when the two nations will know no other "rivalship than such as will be dictated by their wishes to improve Agriculture, and all the arts fa-"vourable to peace.*"

[PORTUGAL.]

XXXVIII. *Answers to Queries from the President of the Board of Agriculture, respecting the Sheep of Portugal.*

QUERY 1. *Are the sheep originally of the country, or of foreign extraction? are they wild, or perfectly domestic? are they hardy or delicate?*

Answer. They are of the original breed of the country; domesticated; naturally rather delicate.

Q. 2. *In what particular do they differ from other kinds?*

Ans. The genuine breed are small in size, and have very fine wool.

Q. 3. *What is the weight of a sheep when cut up?*

Ans. When in the best order, it may weigh from thirty-four to thirty-five pounds.

Q. 4. *Is the mutton remarkable for delicacy of flavour?*

Ans. If fat, and in good order, it is very delicate and high flavoured.

Q. 5. *What is the weight and common price of a fleece of wool?*

Ans. Each fleece weighs about 12 lbs.; if it is well washed and cleaned, it is worth £ 2. 14*s.* per *arroba*, or 25 lbs.; but as it comes off the sheep, without being picked or washed, it is sold for £ 1. 7*s.* per *arroba*.

Q. 6. *What is the quality, length, and colour of the wool? and for what manufacture is it most proper?*

Ans. It is short, white, and curls naturally. It is fit for fine woollen cloths, hats, stockings, &c.

Q. 7. *At what age does the breed arrive at its greatest perfection? and what quantity of suet does it yield?*

Ans. It begins to breed at two years, and at four it is at its greatest perfection; the suet weighs about 6 lbs.

Q. 8. *How many lambs have they at a time? and at what season do they yean?*

Ans. In general only one; it however sometimes happens, though seldom, that they yean two at a time: they regularly yean in November, and some of the lambs are yeaned with a little, and others without any, wool.

Q. 9. *How should they be treated, and what is their best food?*

Ans. In moderate weather they should graze; but in cold, damp, foggy weather it would be proper to house them in separate pens; then they should live upon hay, straw, and barley, and once a week there should be a little salt mixed with their food.

Q. 10. *What disorders are they subject to? and what are the best preventives and method of cure for them?*

Ans. Their most common complaint is bloody urine, for which there never has yet been found any cure. There is another disorder to which they are subject in this country (Portugal); the symptoms are a tumefaction all over their body, attended with great difficulty in respiration: this complaint is soon removed by bleeding in the ears. The itch is likewise a common disorder amongst them, which, however, is soon cured by washing the part affected frequently with a decoction of fresh broom, gunpowder dissolved in strong vinegar, or a strong decoction of tobacco leaves.

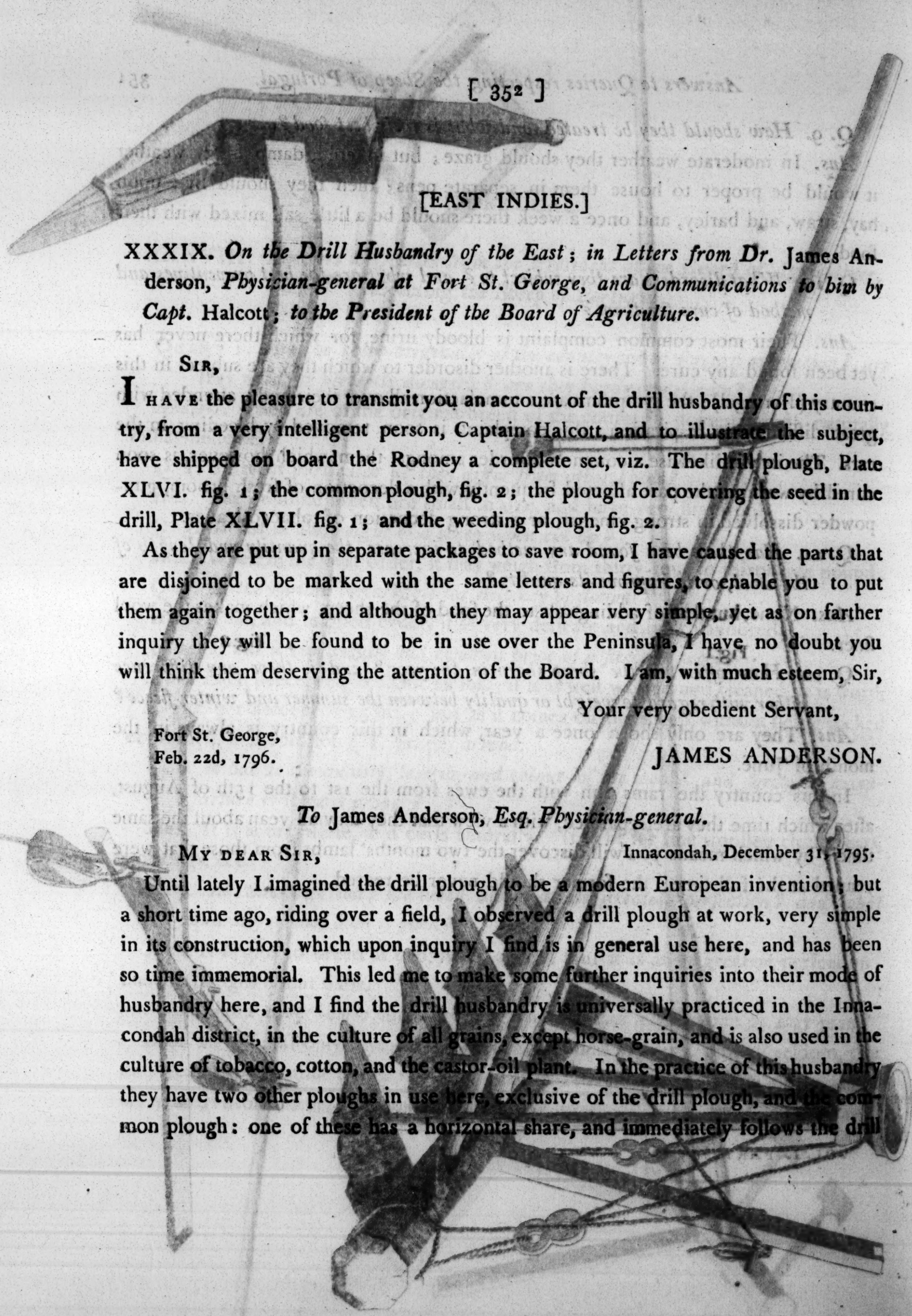
Q. 11. *Has there been found any method to increase the quantity and length of the wool, or to improve its quality?*

Ans. None, but that of adding salt to the food of the sheep, which makes the wool finer.

Q. 12. *How often are the sheep shorn in the year? and is there any difference either with regard to weight or quality between the summer and winter fleece?*

Ans. They are only shorn once a year, which in this country is always in the month of June.

In this country the rams run with the ewes from the 1st to the 15th of August, after which time they are separated, with a view that they may all yean about the same time; by which means you will discover the two months' lambs from those that were yeaned at the full time; the former should never be reared.



[EAST INDIES.]

XXXIX. *On the Drill Husbandry of the East; in Letters from Dr.* James Anderson, *Physician-general at Fort St. George, and Communications to him by Capt.* Halcott; *to the President of the Board of Agriculture.*

SIR,

I HAVE the pleasure to transmit you an account of the drill husbandry of this country, from a very intelligent person, Captain Halcott, and to illustrate the subject, have shipped on board the Rodney a complete set, viz. The drill plough, Plate XLVI. fig. 1; the common plough, fig. 2; the plough for covering the seed in the drill, Plate XLVII. fig. 1; and the weeding plough, fig. 2.

As they are put up in separate packages to save room, I have caused the parts that are disjoined to be marked with the same letters and figures, to enable you to put them again together; and although they may appear very simple, yet as on farther inquiry they will be found to be in use over the Peninsula, I have no doubt you will think them deserving the attention of the Board. I am, with much esteem, Sir,

Your very obedient Servant,

Fort St. George,
Feb. 22d, 1796.

JAMES ANDERSON.

To James Anderson, *Esq. Physician-general.*

MY DEAR SIR, Innacondah, December 31, 1795.

Until lately I imagined the drill plough to be a modern European invention; but a short time ago, riding over a field, I observed a drill plough at work, very simple in its construction, which upon inquiry I find is in general use here, and has been so time immemorial. This led me to make some further inquiries into their mode of husbandry here, and I find the drill husbandry is universally practiced in the Innacondah district, in the culture of all grains, except horse-grain, and is also used in the culture of tobacco, cotton, and the castor-oil plant. In the practice of this husbandry they have two other ploughs in use here, exclusive of the drill plough, and the common plough: one of these has a horizontal share, and immediately follows the drill

Plate XLVI.

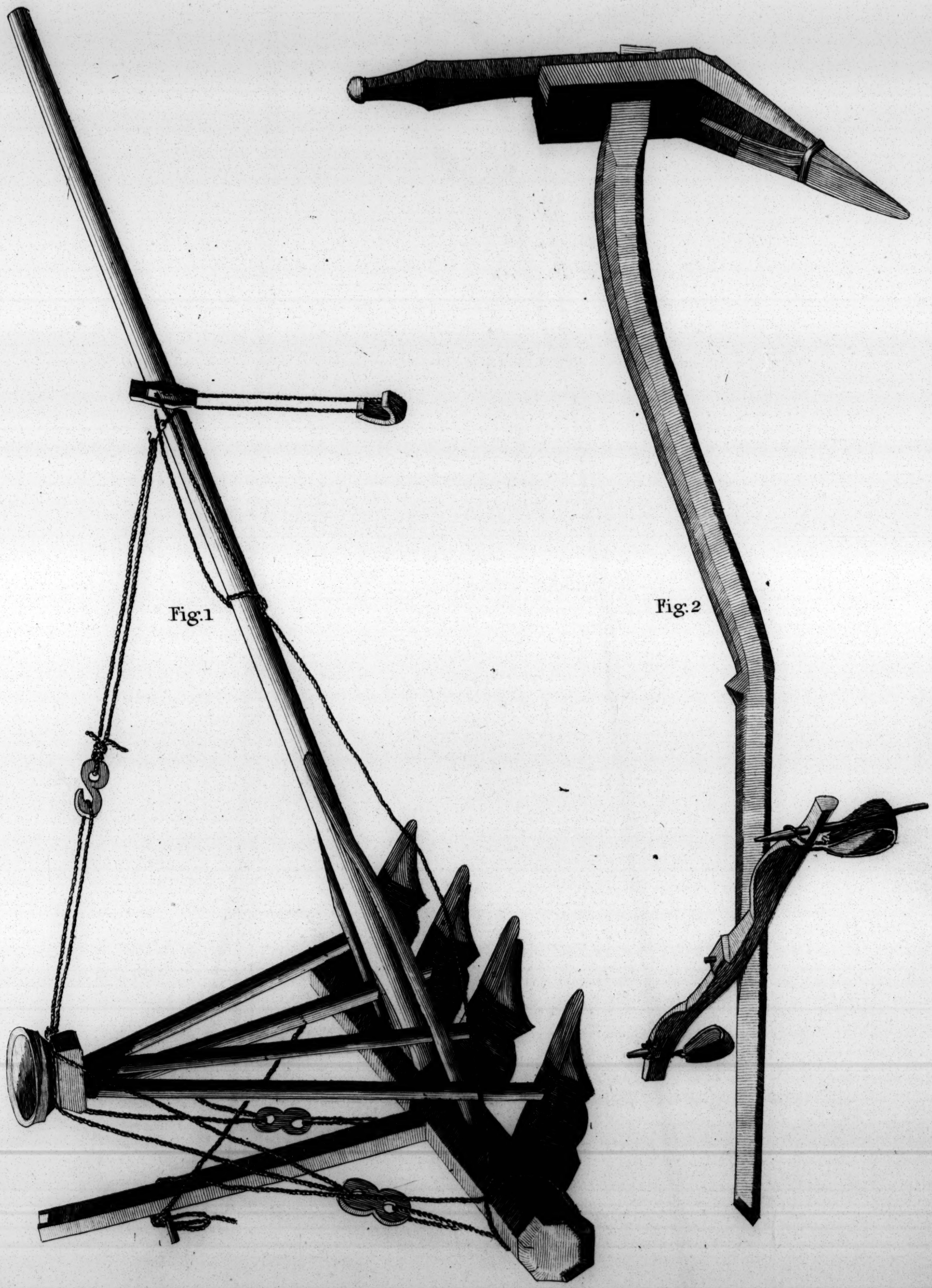


Fig. 1

Fig. 2

Neele sc. Strand.

Plate XLVII

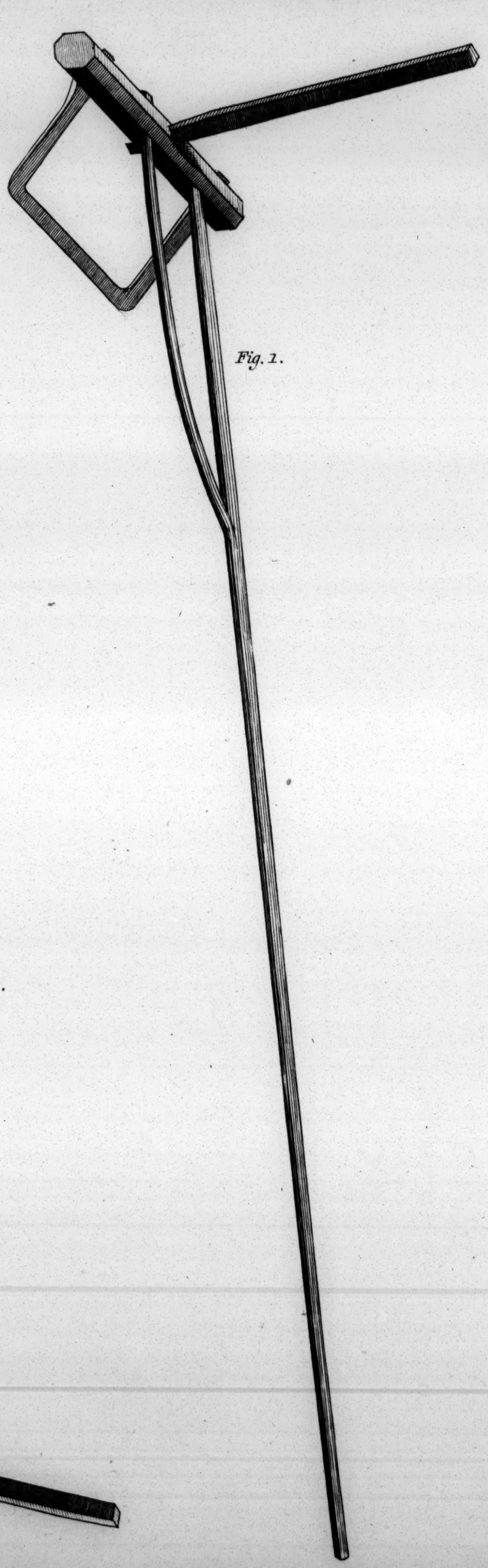


Fig. 1.

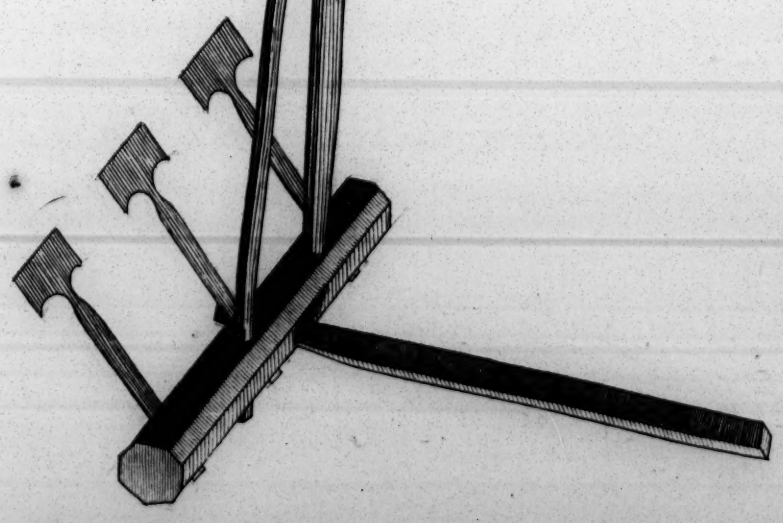


Fig. 2.

plough at work. It is set into the earth about the depth of seven or eight inches, and passes under three drills at once. It operates by agitating the earth so as to make the sides of the drills fall in, and cover the seed-grain, which it does so effectually as scarcely to leave any traces of a drill. The other plough alluded to, is used after the corn is about eight or ten inches high. It cuts up the weeds between three drills at once, and earths-up the roots of the corn at the same time. I cannot, by writing, give you an adequate description of the three ploughs, but will send you a set of them, if you wish it, accompanied by a man who has been in the practice of working them.

I have some reason to think this drill plough, simple as it is, possesses an advantage that the patent drill plough does not; for I remember reading in some publication, that the patent drill plough was defective in not dropping the grain equally; this plough has no defect of that kind. It has three teeth about eighteen inches long, and ten inches asunder; through the upper end of each tooth, near the back, is inserted a hollow bamboo of an inch in diameter, and about three feet in length, these three bamboos are set upright, and their upper ends are brought nearly together, in the form of a triangle, and inserted through the bottom of a wooden cup. This apparatus is supported and made steady by cords, in the way of shrouds, which lead to different parts of the plough.

In working the plough, the cup is not filled with grain, but is fed by hand; this labour is performed by a woman, who walks on the left side of the plough with a bag or large pocket of grain before her, her right arm stretched out, and her wrist resting on the edge of the cup; her hand is filled with grain, and by moving her fingers she lets drop into the cup as much grain as supplies the three drills in due proportion. When the grain in her right hand is nearly expended, she fills it again from her left hand, observing never to take her right hand from the cup, while the plough is in motion, as that would leave a vacant space in the field. The drill plough, which drops the grain by some piece of mechanism, will probably never sow a field so equally as is done in this way; and here is a remedy for the defect complained of in the English drill plough. Whether the expence of two persons to work this plough, may or may not make against its being introduced into England, in preference to that now in use, I shall leave to be determined by those who are better acquainted with the subject; yet when it is considered, that supplying the cup is a labour performed by women, and how soon an acre is sown in this way, perhaps it might not

be rejected on account of the additional expence, which would be but trifling. The first cost of a plough of this kind would be but a few shillings, whereas the patent drill plough is an expensive machine.

A gentleman who is now here on a visit, informs me that his grandfather, who farms part of his own estate, practices the drill husbandry, but found the drill plough dropped the grain so unequally, that he laid it aside; and now, from a conviction of the superiority of the drill husbandry, uses a drill roll, which has a number of pegs upon it, and makes holes in straight lines, into which the seed-grain is dropped by hand. This is a tedious way, and he informs me has also its defects, as it is done by children whose hands, in the cold season when wheat is sown, are apt to get numb, and they often drop too many grains into each hole. However, many prefer this method to the drill plough at present in use. Whether the plough with a horizontal share for covering in the drills is in use in England, I know not; if not, it will be an acquisition to those who practice the drill husbandry. I am also equally uninformed, whether the instrument used here for cutting up the weeds between the drills is known in England. It is simply three small mamoties set upon three teeth, placed at the same distance from each other as the teeth of the drill plough.

By my sending you these instruments, you will have a better idea of them than I can convey in writing; but as I am informed by a man from the Carnatic, that the drill husbandry is used in some parts of it to the westward, you may possibly have seen these ploughs, and in that case it will be unnecessary.

You correspond occasionally with the Board of Agriculture; should you think these instruments would be useful in the drill husbandry at home, I will thank you to forward the set I shall send you to them. If, however, you should find that these instruments have been already described in any publication, and that it is a matter known among Europeans, that the drill husbandry has long been practiced in this country, it will of course be worth no farther attention. But so far as I know at present, I am the first European that ever noticed it, for although it has been practiced under the eyes of every body in the Guntoor circar, no one that I mentioned it to ever observed it before, nor did I observe it myself till lately.

I shall send a cart to Madras in a few days, for some articles I want from thence, and will take that opportunity of sending you some of the lava, &c. from Bogulcondah, which has evidently been a volcano, as you will know from the appearance of the substances I shall send. The crater, however, is now so choked up as to contain

water, and certainly no eruption can have happened for ages. The natives have no tradition of its having ever been a volcano; but the name, and the lava with cinders in the heart of it, as well as the burnt and vitrified stones which compose the hill, are proofs positive that it was once a volcano. I could find no pumice stone; perhaps the fossil that burns to pumice stone may not be here, or the eruption may have happened so long ago, that every substance of that kind may have gone to dust.

I remain, my dear Sir,

Yours very truly,

THO. HALCOTT.

Extract of a Letter from Dr. Anderson, *to Capt.* Halcott; *dated Madras, 5th Jan.* 1796.

The drill plough you describe, is, as far as I know, unknown in Europe, and will no doubt be esteemed a valuable present, by the Agricultural Board; to whom you may depend on my sending it by the very first ship.

Extract of a Letter from Capt. Halcott *to Dr.* Anderson; *dated Jurrecondah, Jan. 10th,* 1795.

This is not a rice country, but a Carnatic man, whose family practices the drill husbandry somewhere to the westward of Madras, informs me, that it is there used in the culture of rice, and is vastly superior to the method generally used of making a seed bed, and transplanting it by hand.

At the commencement of the rains, he says, the paddy-field, after being well ploughed with the common plough, is sown by the drill plough, and left to the natural rains till it gets into ear, and it is then, and not till then, flooded by art; so there is not only a great saving of labour, but of water, which in years when the rains are scanty, is a more material saving, than even that of labour.

He informed me, that the drill husbandry to the westward of Madras was only partially used, and that, chiefly by the wealthiest and most intelligent of the Ryots. I asked him, how it could happen that the poorer sort did not avail themselves of so obvious an advantage? he said that the people were poor and ignorant, and it could not be attempted by those who had less than three yoke of stout oxen; one for the

drill plough, another for the horizontal plough which follows, and allowance made for the accidental lameness and sickness of cattle; the weaker are not able in a miry soil, such as paddy-field, to draw the plough so straight as is required, and buffaloes are seldom so manageable as to plough very straight; these, said he, are the reasons why the drill husbandry is not more generally adopted in the culture of rice, for all agree in this, that it saves a great expence of labour and of water.

Every thing in this district, except horse-grain, is cultivated by the drill husbandry; I may mention hemp in addition to the articles I before enumerated. Of its superiority in the culture of cotton, I had a convincing proof the other day, when I saw more weeds cut up by the mamoty plough before described, in an hour, than could have been done by hand by many Coolies, in a whole day.

This cotton was of a dwarf species, and was sown by the drill plough; I saw another field of a different kind, the drills about thirty inches asunder; this I understand was sown by hand; the drills were made by the common plough. In the same way is sown the castor-oil seed, the drills about a yard asunder; in short, the drill husbandry is practiced by every Ryot in this district, without a single exception.

[EAST INDIES.]

XL. *Hints respecting the Information that may be procured from the East Indies by the Board of Agriculture. In a Letter to the President of the Board.*

The principal objects of research in India naturally divide themselves in two classes, the curious and the useful; the former presents a most wide and fertile field, both as to literature and natural productions. The great stores of learning that have been laid open by the genius of Sir W. Jones, Mr. Wilkins, and Mr. Halhed, have yet been very imperfectly explored; and the astronomical papers of Mr. Burrow, Mr. Davis, and others, have given only some small specimens of what the Hindoos possess in that science. In regard to natural productions, the public, I hope, will soon be favoured with the most complete system of the vegetable world in India, that any country can boast of, drawn up in the most correct botanical arrangement of the Linnean system, and illustrated with coloured drawings from nature, of every plant. This great work has occupied the whole time, genius, and industry of Dr. Bruce, who I believe to be one of the best botanists living, for upwards of fifteen years. The common objects of the antiquarian in regard to buildings, sculptures, &c. may be said to be entirely wanting, a few Hindoo monuments excepted: every thing Mahometan is necessarily of modern date.

But it is objects of *useful* knowledge to which, it is presumed, the Board of Agriculture would chiefly wish to direct the attention of those, who may be applied to in India for assistance, in promoting the great and extensive plan in which the Board is engaged. Under this head may be comprehended Agriculture, Arts and Manufactures, raw materials, and a large class of miscellaneous objects, tending either to furnish the means of promoting industry, increasing articles of sustenance, or alleviating human misery.

Agriculture in India, where nature has been so bountiful, and where of course the labour and skill of the husbandman is required to be exerted in so limited a degree, is an object little attended to with a view to improvement; and it is committed solely and entirely to the hands of the lowest peasants; no man of rank or fortune ever inte-

resting himself in it. The peasant, with a couple of small oxen and a plough, so light that he carries it home on his shoulder, when he unyokes his bullocks, just scratches the fine, light, rich mould, which composes uniformly the whole surface of the country, then sows his seed, and harrows it with a log of wood, upon which he sometimes stands, when he wishes it to smooth the surface and act as a roller, and this is dragged by the same small oxen. With such preparation, every field looks like the finest piece of garden ground, that can be seen in the neighbourhood of Chelsea. After this, the only farther care of the husbandman is to water his field, which is by far the most troublesome part of his labour; and perhaps, of the few things belonging to Indian farming, from which any useful lessons can be learnt, their system of irrigation is one. After such culture as I have mentioned, the crops are most abundant. Of all the various kinds of tropical productions, it is unnecessary to speak here, but their wheat and barley, I believe to be of a quality far superior to any in this country; the wheat in particular is so extremely large, full, and heavy in the grain, that I am persuaded any given measure of it, would weigh much more than the same quantity of English wheat. I wrote last year for some of the best kinds to be sent me home for seed, and hope soon to be able to ascertain, whether or not it will thrive in this country: but which I much doubt, as I attribute its superior excellence almost entirely to sun and soil. Of rotations of crops they know little, and still less of artificial manures; even of dung they have little, as they seldom have occasion to house their cattle. Their cattle and sheep-farming is in a state of great simplicity, and managed without art or care; butchers-meat is not wanted but for the Mussulmen, and they are very indifferent about its quality; the use of cured meat is unknown. The wool of India is coarse in quality, and very little employed for any purpose by the natives; a very little, for coarse rugs or blankets, which are only used by the lowest peasantry for two or three months of the year, and some for carpets, are the only purposes to which it is applied, so that the greatest part is thrown away as offal. Sheep are sold for from 10 to 20 rupees (a rupee at an average may be reckoned at *2s. 3d.*) per score; and an ox at from 5 to 10 rupees. Milk, in its fresh state, is so important a part of the food of the Indians, that the operations of the dairy are little known: they use cheese, but entirely in its fresh or green state, of a few days old; and their butter is made of boiled milk, and afterwards clarified by heat, in which state it is called *ghie*.

The manufactures of India, it is well known, are large and extensive, but the art of spinning and weaving cotton is perhaps the most important to be attended to, with

a view to benefiting our own manufactures by their example, might it not be of use to get the East India Company to send out some persons on purpose to learn the Indian method of spinning and weaving cotton, in order more successfully to improve our manufactures of muslin, &c.? In the manufacture of silks we already excel them; and in hardware, and every article of metal, they are in a state of great rudeness and backwardness.

Of the useful arts, there are perhaps none among the Indians from which we could borrow more useful knowledge, than the art of dying. It is one which they have had in great perfection from time immemorial, and the beauty, brilliancy, and variety of colours, is what they still make a particular object of their attention. To them we are solely indebted for the art of printing upon cotton or linen; it is one which they still possess in great perfection. The word *chintz* is pure Indian, and signifies in its simplest meaning, *spotted*.

Of raw materials, the two which occur to me at first view (besides those which are already objects of commerce) are sugar and cotton: but they are articles of such importance to the general commerce of the empire, that it would require a great deal of thought and deliberation, to say much upon the subject. They well deserve, however, to be maturely considered; and I shall only say, from my own knowledge, that I believe both might easily be procured in India, in quantity sufficient for the consumption of Great Britain, or perhaps of Europe.

Of the various miscellaneous objects of inquiry, that of medicine may be considered as of considerable importance. Of this, considered as a science, both Hindoos and Mussulmen are most deplorably ignorant. They know nothing of anatomy; they think the circulation of the blood an idle fable, and are totally unacquainted with the laws of the animal economy. But India I believe to be rich in powerful simples, and in many specific remedies, which would be very proper objects of research. The art of surgery is still practiced by the barbers in India, and broken bones are set by the workers in horn.

I should also have mentioned, that another very desirable object would be, some general and statistical account of the different provinces under the British government, in respect to population, produce, trade, and such other general topics as would not interfere with the civil government or regulations of the Company, which I conceive ought to be avoided.

I should also mention, that when I speak of India, I mean only Bengal, and the

countries to the north-west of it, upon the Ganges, to the source of that river, and as far as Delhi; these being the only parts of India where I have resided.

The names of the gentlemen in Bengal, who are most likely to assist in procuring useful information to the Board, are

Sir John Shore, President of the Asiatic Society in Calcutta.

Mr. Davis, resident at Boglepoor, who is equally distinguished for his research in Hindoo astronomy, and for his attention to farming and horticulture.

Dr. Robert Bruce at Lucknow, whom I have already mentioned.

Dr. Ralph Irwing, the best chemist I know in India, and a man of great science and research in all branches of natural history.

Dr. W. Hunter, surgeon of the embassy to the Mahratta states, a gentleman of great knowledge and observation, and whose communications may be particularly valuable, from his residing in a part of India to which we have not access, except by means of some diplomatic mission.

To this list many more might be added; but for the present these may perhaps be sufficient.

[AMERICA.]

XLI. *Extract of a Letter from his Excellency* John Jay, *to the President of the Board of Agriculture, on Salt as a Manure, and a particular species of Apple; dated New York, 12th Nov.* 1795.

You may remember my mentioning to you, that common salt had been used with success as a manure for flax, and my promising to procure and transmit to you more particular information respecting the quantity or proportion of salt which was found to be most proper.

I have taken some pains to ascertain this; but from the result of my inquiries there is reason to presume, that further experiments, accurately made, are necessary to afford a satisfactory answer to the question; and the more so, as the nature of the soil, and perhaps the season, do not appear to me to have been sufficiently regarded, and which may possibly account for certain proportions of salt succeeding much better in some instances than in others. A gentleman in New England has published some facts, from which it appears, that the subject merits attention. He says,

"In June 1786, I salted one bed of my onions, one bed of my carrots, and one bed of my early turnips, laying the salt under the surface, in the centres of the intervals between the rows, at some distance from the roots, that the salt might have time to be dissolved and altered before the fibrous roots should reach it. The carrots of the salted bed evidently grew much larger and better than the rest; but I could not perceive that the salt was at all beneficial to the onions, or to the turnips.

"According to Mr. Ford's experiment in salting flax ground, salt seems to be highly beneficial to that crop. He spreads the salt at the time of sowing the seed, and thinks that the quantity of salt should be *double* to that of the seed; from three acres in flax salted, he had fifty bushels of seed, and an excellent crop of flax. Mr. Elliot tells us of *five* bushels of salt being applied to *one* acre of flax, which is a much larger proportion, and that it had an extraordinary effect; and also of a crop of wheat being increased by salt."

A gentleman from Dutches county, in this state, passed last evening with me.

Speaking of apples, the one-half part of *each* of which was sweet, and the other half part tart or sour; he told me there were trees which produced such apples in or near his neighbourhood; that he had examined and tasted the apples, and that many others had done the same. He told me, that on inquiry he had been informed, that the method of obtaining such apples, was as follows, viz.

Take two scions or grafts, one from a *sour*, and the other from a *sweet*, apple-tree; divide or split with a sharp knife each graft into two parts or halfs, taking care to pass the knife through the centre or middle of as many *buds* as are in a line with each other; then take one half of the sweet graft and join it to a half of the sour graft, in such a manner that two or more of the half buds on each, do exactly meet and fit each other; then carefully wind round them worsted or woollen thread to keep them together; and having thus become one graft, cut it so as that the bark of the wedge part of it, which enters the stock or tree engrafted, being partly of both kinds, may receive the sap of the stock on both sides. If this artificial graft takes and grows, which frequently happens, the two parts of which it consists will gradually unite and incorporate, and become a tree, whose fruit, on the branches shooting from the united buds, and partaking of both natures, will be on one side sweet, and on the other sour. He particularly examined an apple of this kind, which on one side exactly resembled a winter apple, called here Rhode Island Greening, but on the opposite side was of a different colour and appearance. He was assured that this apple was from a tree composed in the manner before mentioned, of grafts from a Rhode Island greening, and a common sweet apple-tree.

You will receive herewith inclosed, the first volume of the Memoirs of the American Academy; in the 386th page you will find an account of an apple-tree, which produced fruit of this singular kind; so that however marvellous the story of these apples may seem, you will see that I do not speak without *book*.

[AMERICA.]

XLII. *Letter from Dr.* Priestley *to Sir* John Sinclair, *President of the Board of Agriculture.*

SIR, Philadelphia, April 9th, 1797.

THOUGH not employed in Agriculture, and my philosophical pursuits have had other objects, I have not been wholly inattentive to a subject of so much importance; and though I am not able to supply you with any thing out of my own stores, I am happy to have it in my power to communicate something from the labours and observations of others.

I have fortunately become acquainted with Mr. Joseph Cooper, who lives opposite to this city, on the Jersey shore, a great original genius in agriculture, and farming in general. Without any advantage of education superior to other farmers, he has thought philosophically on the subject, and has had very extraordinary success, in a variety of plans which are wholly new, and which promise to be of great benefit to his country and the world.

I have his leave to communicate to you his observations and experiments relating to an opinion and practice which has prevailed, I believe universally, but which he is satisfied is ill founded. Plants, it is said, will degenerate, unless the soil in which they grow be changed. It is therefore thought to be necessary from time to time to get fresh seeds and roots, &c. from distant places. Mr. Cooper, on the contrary, has for many years been in the habit of selecting the best seeds and roots of his own, and though he has continually sown and planted them in the same soil, every article of his produce is greatly superior to those of any other person who supplies this market, and they seem to be still in a state of improvement. This, without his knowing it, is the very same plan that was adopted by Mr. Bakewell in England, with respect to animals. He kept improving his breeds, by only coupling those in which the properties he wished to produce were the most conspicuous, without any regard to consanguinity, or any other circumstance whatever.

Mr. Cooper was led to his present practice, which he began more than forty years ago, by observing that vegetables of all kinds were very subject to change with

respect to their time of coming to maturity, and other properties, but that the best seeds never failed to produce the best plants. Among a great number of experiments he particularly mentions the following:

About the year 1746, his father procured seeds of the long watery squash, and though they have been used on the farm ever since that time, without any change, they are at this time better than they were at the first.

His early peas were procured from London in the year 1756; and though they have been planted on the same place every season, they have been so far from degenerating, that they are preferable to what they were then. The seeds of his asparagus he had from New York in 1752, and though they have been treated in the same manner, the plants are greatly improved.

It is more particularly complained, that potatoes degenerate when they are planted from the same roots in the same place. At this Mr. Cooper says he does not wonder, when it is customary with farmers to use the best, and plant from the refuse; whereas, having observed that some of his plants produced potatoes that were larger, better shaped, and in greater abundance than others, he took his seed from them only; and the next season he found that the produce was of a quality superior to any that he had ever had before. This practice he still continues, and finds that he is abundantly rewarded for his trouble.

Mr. Cooper is also careful to sow the plants, from which he raises his seed, at a considerable distance from any others. Thus, when his radishes are fit for use, he takes ten or twelve that he most approves, and plants them at least one hundred yards from others that blossom at the same time. In the same manner he treats all his other plants, varying the circumstances according to their nature.

About the year 1772, a friend of his sent him a few grains of a small kind of Indian corn, not larger than goose-shot, which produced from eight to ten ears on a stalk. They were also small, and he found that few of them ripened before the frost. Some of the largest and earliest of these he saved, and planting them between rows of a larger and earlier kind, the produce was much improved. He then planted from those that had produced the greatest number of the largest ears, and that were the first ripe; and the next season the produce, with respect to quality and quantity, was preferable to any that he had ever planted before. From this corn he has continued to plant ever since, selecting his seed in the following manner:

When the first ears are ripe enough for seed, he gathers a sufficient quantity for

early corn, or for replanting, and at the time that he wishes his corn to be generally ripe, he gathers a sufficient quantity for the next year's planting; having particular care to take it from stalks that are large at the bottom, of a regular taper, not very tall, the ears set low, and containing the greatest number of good sizable ears, and of the best quality; these he dries quickly, and from them he plants his main crop; and if any hil s be missing, he replants from the seeds that were first gathered, which he says will cause the crops to ripen more regularly than they commonly do, and which is of great advantage. This method he has practiced many years, and he is satisfied that it has been the means of increasing the quantity, and improving the quality, of his crops beyond what any person who had not tried the experiment could imagine.

Farmers differ much with respect to the distance at which they plant their corn, and the number of grains they put in a hill. Different soils, Mr. Cooper observes, may require different practices in both these respects; but in every kind of soil that he has tried, he finds that planting the rows six feet asunder each way, as nearly at right angles as may be, and leaving not more than four stalks in a hill, produces the best crop. The common method of saving seed-corn, by taking the ears from the heap, is attended, he says, with two disadvantages; one is the taking the largest ears, of which in general only one grows on a stalk, which lessens the produce; and the other is taking ears that ripen at different times.

For many years Mr. Cooper renewed all the seed of his winter grain from a single plant, which he had observed to be more productive, and of a better quality than the rest, which he is satisfied has been of great use. And he is of opinion, that all kinds of garden vegetables may be improved by the methods described above, particular care being taken that different kinds of the same vegetables do not bloom at the same time near together, since by this means they injure one another.

It is alleged, that foreign flax seed produces the best flax in Ireland; but Mr. Cooper says, that when it is considered that only the bark of the plant is used, and that this is in perfection before the seed is ripe, it will appear that his hypothesis is not affected by it.

Mr. Cooper had the following instance of the naturalization of a plant in a different climate: he had some water-melon seed sent to him from Georgia, which he was informed was of a peculiarly good quality; knowing that seeds from vegetables which grow in a hot climate require a longer summer than that of Pennsylvania, he

gave them the most favourable situation that he had, and used glasses to forward their growth, and yet few of them ripened well. But finding them to be of an excellent quality, he saved the seeds of those that ripened the first; and by continuing this practice five or six years, they came to ripen as early as any that he ever had.

I cannot express how much I admire the exertions already made with respect to the great objects pursued by the Board of Agriculture. They promise to counteract the destructive effects of war, and in time of peace will, I hope, speedily repair all the calamities occasioned by it, as it can be done by the better condition of those who survive them. I particularly admire the liberality of your Address to all nations, on a subject so highly interesting to them all; and I promise myself a new and more happy era in the state of society from it. With the greatest respect, I am, Sir,

Yours sincerely,

J. PRIESTLEY.

P. S. I am directing a few experiments on the use of gypsum as a manure, which I think will ascertain the principle on which it acts, and may lead to a more effectual application of it. If I have any success, you shall hear from me again.

[AMERICA.]

XLIII. *Answers to Queries respecting Sheep in America, chiefly confined to those of Pennsylvania. By a respectable Farmer near Philadelphia. Transmitted to the President of the Board of Agriculture by General* Washington.

QUERY 1. *Is the breed, so far as it can be ascertained, a native or a foreign species? is it wild, or completely domesticated? is it hardy or delicate?*

Answer. The sheep in America are not natives; there are no wild sheep; they are of course all domesticated. No animal requires more care and attention than this; it is naturally timid and helpless, and seems to have less of the instinct, which in brutes is a substitute for reason, than any other beast. It cannot defend itself against its numerous foes; it is a prey to dogs at home; and if it should stray into the forests, the beasts of prey would soon destroy it. Some are, comparatively with *other sheep*, more hardy, but compared with other beasts, they are all delicate. The apparent hardiness of some is owing to the little care taken of them, but these are runted and small, their fleece bad, wool coarse, and little of it; their teeth soon decay, and they are short lived, though they seem strong enough for a time.

Q. 2. *Is it supposed to be pure, or has it been crossed with other breeds? In what respect does it chiefly differ in its shape and appearance from other sheep, whether in regard to height, length, breadth, or otherwise?*

Ans. There has been no general care to preserve a purity of breed. Some farmers are attentive for a time, but finally grow negligent. The stock of our sheep is European; the Swedes and Dutch had a few previous to English settlers, but the importations of any consequence were from England. The Germans also brought sheep, and I have known some from Spain; and, I think, a pair of *Persian sheep*; but the great proportion is from the English stock. There are no great varieties, as the breeds have been mixed; but the American sheep resemble most, in shape and figure, those of England. In size they are generally smaller.

Q. 3. *What is the average weight of its whole carcass? the weight of its fore and hind quarters? the number of its ribs, &c.?*

Ans. The average weight of sheep in Pennsylvania, when fat, does not exceed

48 lbs. nett. I have known the carcass of a sheep weigh 112 lbs. and have heard of one, weight 130 lbs. The weight of the quarters may be judged of from that of the whole. It lays the fat most on the hind quarters, which are therefore the heaviest. The number of ribs is generally twelve on a side; some have twelve and a false one.

What is called the common run of good sheep, in the Philadelphia market, weigh 60 lbs.; but 80 lbs. the carcass is not uncommon. The price of mutton, the year through in that market, is about $4\frac{1}{2}d.$ currency; and the price of sheep in flocks, when poor, is about 7*s.* 6*d.* a piece, or 4*s.* 6*d.* sterling.

Q. 4. *What is the nature and quality of the mutton?*

Ans. The mutton of this country differs as it does in others; that fed on short bites, and hilly lands, is the best; the smaller sized, if well fatted, is also the sweetest and best flavoured. It is generally accounted better than the *large* English or German mutton; but the small mutton of Wales and other hilly countries is as good, but I think not superior to ours, in the same kind of country. Our best flavoured mutton is not common in the market of the capital; the largest and fattest is to be found there, but the choicest and finest meat is only to be had at a distance, in the neighbourhood of hilly, or relatively barren, countries.

Q. 5. *What is the average weight and value of its fleece?*

Ans. The heaviest fleece I ever knew weighed 13 lbs. nett. The price of wool, on an average, is an English shilling per pound. Three pounds to a fleece is an ample average allowance.

Q. 6. *What is the nature, length, colour, and price of its wool, and the purposes for which it is best calculated?*

Ans. I am not manufacturer enough to answer this question fully. I have seen home-spun cloth of the fabric of an English superfine. It is said that we have wool as fine as that of England at least; but it rather appears best calculated for the coarser kind of cloths. These are manufactured here to great perfection, and will outlast any imported. The colour of our wool is generally white, but it sometimes gets dusky from a mixture of the black and white sheep, both of which we have, the white being by far the most common.

Q. 7. *At what age does the breed arrive at perfection, and what is the average quantity of its tallow, when fat?*

Ans. Few sheep keep their prime longer than seven years; it depends much on their treatment; at this age they generally begin to decline. None will bear to be

full fatted and suffered to grow lean, at any age: they always perish with disease, if this happens. The average weight of the tallow is about one-eighth of the carcass, if the sheep is well fatted.

Q. 8. *What is, in general, the number of lambs at each birth? at what season of the year do they lamb? and are the lambs well covered with wool when born?*

Ans. Three at a birth sometimes happen, two very commonly, frequently but one. No care is taken to prevent the intercourse with the rams at improper periods, and therefore the ewes often lamb in a severe season. The time of yeaning is generally from the middle of February to the end of May; the most are lambed in March and April; some are dropped at Christmas. They are as well covered with wool as is common with lambs of other countries. It is rare for a ewe to lamb twice a year, though I have known it happen.

Q. 9. *What is considered to be the best method of managing the breed? to what food are they most accustomed, or seems best to agree with them?*

Ans. The answer to the first part of this Query would require a long discussion. We have not been attentive enough to establish solid principles. The Europeans know best how to improve and preserve the breed of this animal, because they have had more experience, and both the flesh and fleece are in greater demand. It is not the particular race which ought, exclusively, to be attended to, for the same family of animals confined to one another will degenerate. The strain must be crossed, and the points, qualities, size, and figure, be selected from a variety, till the perfect animal is obtained. Some successful attempts have been made on this scale here; but Bakewell in England has indubitably established its practicability and value. Our manufactures are not sufficiently flourishing to create extensive demands for the fleece, and a small addition to our present stock would glut our markets for the flesh. If it were an object, the flesh will bear salting for exportation, but it will be some time before this will be worth attending to. The best method we can now take, is for every farmer to keep a few sheep, not more than a score to a common sized farm. No greater number should be kept together; and these could be attended to without injury to the common affairs of the farm. A prodigious number could be raised in this way, and both the breed, and all other circumstances better managed. Labour is too high, and of course hands too scarce, to afford devoting any to the sole employment of shepherds; nor is the demand great enough to induce making the sheep business a separate branch. Premiums given by government, or from private sub-

scription funds, under the direction of the Agricultural Societies, which are spreading themselves through every part of the United States, would assist in the attainment of what is the most wanted, a perfect breed of domestic animals, horses, cattle, and sheep included. *Emulation* would be set at work, and the laudable pride of excelling each other, would stimulate intelligent and attentive farmers to this kind of exertion. A breed thus obtained will exceed any importation; the animal will be assimilated to our climate, in which there are some peculiarities not favourable to all imported breeders, or their progeny unmixed.

As to the food, it is of the same nature in most countries. Sheep are close biters and great consumers of pasture; the shorter and drier the herbage in summer the better; in winter they require, in addition to hay, Indian corn, tops and blades, and other dry fodder, some succulent food; but our snows forbid the turnip fodder extensively. I had one winter a great quantity of the root of scarcity, and my sheep were never more thriving. It is the most nourishing and healthy food I ever experienced for this animal, and horned cattle.

Turnips are watery and thin food; but sheep should have these, or carrots. Next to the camel, the sheep will subsist the longest without water; when the snows lie long, I give them the branches of the pine, and it has a surprising effect as a preventive against their disorders. Indian corn is most common for fatting winter sheep; it goes the farthest *ground*, and licked dry, adding a little salt occasionally. Every store sheep should have an ear or two of Indian corn twice a week; this preserves their strength, and prevents shedding the fleece. Sheep should not be kept in close stables, except when the lambs are young, and the weather then cold or wet. Open sheds or hovels, and exposure at their pleasure, are greatly preferable. Cold never injures grown sheep or strong lambs: wet long continued, kills them. A change is necessary, both of pasture and local situation; they never thrive if kept more than five or six years on the same farm; those from hilly countries will fatten fast in low lands; but they must be immediately sold to the butcher.

Sheep will eat noxious herbs and plants, which other beasts avoid. It is true, they can eat, without danger, many things poisonous to horses or cattle; yet they have no sagacity in the selection, but stupidly and indiscriminately devour whatever they meet with in the vegetable creation. They eat the tops of several species of the nightshade without injury; but not being able to distinguish the different kinds, they are killed by some species of this tribe. It is also thus with the laurel and the ivy; they eat

these without distinction, though some species of these productions kill them. There is a low plant with a serrated leaf, striped with white, appearing something like the aloe, but very small, which, if eaten, is certain death to them. It is frequent in our woods, and they eat it whenever it falls in their way. Sheep, deer, and goats can feed with safety, on many things fatal to other animals; but both the latter have more sagacity in the selection than the former.

Q. 10. *Their diseases and cure?*

Ans. The most common diseases are the *scower* and the *rot*. The running at the nose I take to be a companion or consequence of the rot, which in its first stage, seems to be a species of *catarrh*. Wet weather long protracted, too luxuriant herbage, wet and sour pastures, or too much water, will produce the *scower*, which is a forerunner of other diseases. Removal into dry pastures stops it; salt is also a remedy. The putrid air of confined stables or folds, wherein too many are kept together, is one cause of the rot. I do not believe, that when the taint is fixed, the animal is ever perfectly cured. Removal to salt meadows has checked this disorder when in its first stages. Tarring the troughs in which they drink, and stinting the quantity of water, are also beneficial. *Camphor* rubbed on their gums, and given in the form of pills, is an excellent remedy for many disorders in sheep. The free use of pitch-pine buds and branches, is an efficacious preventive and remedy. Sulphur is beneficial in the first stages of the rot. The *scab* is not uncommon; poverty, filth, and too great numbers together, produce it. *Lice* are also the companions of poverty: the radical cure is, to decrease your numbers, and keep no more than can be well fed and attended. In the first instance, separate the infected from the healthy sheep. A decoction of hellebore or tobacco, and tar ointment, are serviceable in the first attacks of the scab, which, in its commencement, is a cutaneous disease. Train or linseed oil poured in a line from the forehead to the tail, along the back, will banish lice in sheep or cattle. There is an infinite variety in the countenances of sheep; examine the largest flocks, and you will not find two faces alike. Some observant farmers can tell every sheep by its face, in their own flock. The changes appearing in the countenance and eyes, indicate disease or recovery; but I know not what are the symptomatic appearances peculiar to each. I have known some persons who either had knowledge of this, or were fortunate in *guessing*.

Q. 11. *The methods, if any, to improve the fleece?*

Ans. I am unacquainted with the methods of improving fleeces. I have heard

of some, but they appear to me whimsical. If the fleeces begin to fall off in the spring, owing perhaps to relaxation from too much warmth, or weakness, giving them Indian corn will set the fleece, by strengthening the sheep.

Q. 12. *The clipping of the fleece, and its summer or winter weight and value?*

Ans. The fleeces are clipped but once a year; all our fleeces are taken off in May or June. Sometimes we shear the early lambs in July or the beginning of August; but it is not commonly practiced.

Miscellaneous Observations.—The state of our population and habits now precludes us from going extensively into the sheep-husbandry. If it ever should become necessary, there are immense tracts which might be devoted to it; they are now called *barrens*. These, when burned, throw up a vegetation of white clover, and abound with aromatic herbs and plants, favourable and nutritious to sheep. I do not find our sheep more subject to diseases than those of other countries. But we shall be embarrassed in our means of keeping large flocks through the winter, and in long winters their disorders will be more contagious and fatal. The pelts are now manufactured into parchment and leather, for various uses. The latter is often dyed and substituted for morocco, but it is inferior to it. The parchment of this country equals that imported, and can be increased in quality, so as nearly, if not entirely to supersede the necessity of importation.

The wolves in our mountains are formidable to sheep. But these will decrease, though they may not be extirpated, by the progress of the settlements. I have been told, that the wolf avoids the goat, either on account of its smell or appearance. It is said, that keeping a few goats, especially he-goats, with the sheep, has been on this account practiced with success in some of our frontier settlements.

[AMERICA.]

XLIV. *Extracts of various Communications from his Excellency* George Washington, *President of the United States of America, to the President of the Board of Agriculture.*

I. *Philadelphia, 20th July*, 1794.—" I have received with peculiar pleasure and approbation, the specimen of the County Reports you have sent me. Such a general view of the Agriculture in the several counties of Great Britain is extremely interesting, and cannot fail of being very beneficial to the agricultural concerns of your country, and to those of every other wherein they are read.

" I am so much pleased with the plan and execution myself, as to pray you to have the goodness to direct your bookseller to continue to forward them to me, accompanied with the cost, which shall be paid to his order, or remitted so soon as the amount is made known to me. When the whole are received, I will promote, as far as in me lies, the reprinting of them here.

" I know of no pursuit, in which more real and important service can be rendered to any country, than by improving its Agriculture, its breed of useful animals, and other branches of a husbandman's cares; nor can I conceive any plan more conducive to this end, than the one you have introduced for bringing to view the actual state of them in all parts of the kingdom; by which good and bad habits are exhibited in a manner too plain to be misconceived; for the accounts given to the British Board of Agriculture appear in general to be drawn up in a masterly manner, so as fully to answer the expectations formed in the excellent plan which produced them; affording at the same time a fund of information, useful in political economy, and serviceable in all countries."

II. *Philadelphia, 10th July*, 1795.—" I could not omit so favourable an opportunity, as the departure of Mr. Strickland affords me, of presenting my best respects to you, and my sincere thanks for the Views of Agriculture in the different Counties of Great Britain, which you have had the goodness to send me, and for the

diploma (received by the hands of Mr. Jay), admitting me a foreign honorary member of the Board of Agriculture.

" For this testimony of the attention of that body, and for the honour it has conferred on me, I have a high sense ; in communicating of which to the Board, I shall rely more on your goodness than on any expression of mine, to render it acceptable.

" From the first intimation you were pleased to give me of this institution, I conceived the most favourable ideas of its utility, and the more I have seen and reflected on the plan since, the more convinced I am of its importance, in a national point of view, not only to your own country, but to all others which are not too much attached to old and bad habits to forsake them, and to new countries that are *just beginning* to form systems for the improvement of their husbandry."

III. *Philadelphia, 10th December*, 1796.—" The result of the experiments entrusted to the care of Dr. Fordyce must be as curious, as they may prove interesting to the science of husbandry. Not less so will be an intelligent solution of those Queries relative to live stock, which are handed to the public.

" A few months more, say the third of March next (1797), and the scenes of my political life will close, and leave me in the shades of retirement; when, if a few years are allowed me to enjoy it (many I cannot expect, being upon the verge of sixty-five), and health is continued to me, I shall peruse with pleasure and edification, the fruits of the exertions of the Board for the Improvement of Agriculture ; and shall have leisure, I trust, to realize some of the useful discoveries which have been made in the science of husbandry.

" Until the above period shall have arrived, and particularly during the present session of Congress, which commenced the 5th inst. I can give but little attention to matters out of the line of my immediate avocations. I did not, however, omit the occasion, at the opening of the session, to call the attention of that body to the importance of Agriculture. What will be the result I know not at present, but if it should be favourable, the hints which you will have it in your power to give, cannot fail of being gratefully received by the members who may constitute the board.*

* This alludes to General Washington's recommendation to the Congress of America, to establish a Board of Agriculture in that country.

IV. *Mount Vernon, 15th July, 1797.*—" Our crop of wheat this year, from the best information I have been able to obtain, will be found very short, owing to three causes; an uncommon drought last autumn; a severe winter, with but little snow to protect it; and which is still more to be regretted, to what with us is denominated, *the Hessian fly*, which has spread devastation more or less in all quarters; nor has the latter wheat escaped the rust. The grain, however, except where the rust appeared before it was hard, is extremely fine. We are equally unlucky in our oats, occasioned by a severe drought since the month of April." *

* The British husbandman will thus see, that other countries are liable to unfavonrable seasons, and other agricultural calamities, as well as his own.

[GERMANY.]

XLV. *Extract of a Letter from* A. Thaer, *M. D. Physician of the Electoral Court of Hanover, to the President of the Board of Agriculture. Translated from the German.**

I AM directed by the Royal Electoral Society of Rural Economy at Zell, to signify to the Board of Agriculture, and their President, that the said Society feel the greatest pleasure, and consider it as a particular honour, to establish with them an uninterrupted correspondence, and the most intimate possible connection.

The particular veneration due to so respectable an institution, established in a kingdom not less flourishing by its agriculture, than by its commerce and its manufactures, would alone suffice, to render every communication with them acceptable to our Society. But another motive is still added to this, I mean the declaration of our most gracious Sovereign, officially communicated to us by his Excellency Baron Alvensleben, by which it appears, that his Majesty would be much pleased with this connection.

If this motive acts upon you with the same force that it does upon us (and we have not the least doubt but it does), we may hope, let our Society be ever so much beneath all comparison with yours, either in point of power or dignity, that you will not disdain a sisterly connection with the daughter of our common parent, to whom we must all bear the most unfeigned respect and affection. We shall certainly not be wanting on our parts, in giving you all the assistance in our power, in procuring you all the intelligence, and all the productions, which the northern regions of Germany may be able to supply, for the perfection of Agriculture; in answering your questions to the best of our knowledge, and in executing your orders with the greatest possible punctuality and care.

Permit me to begin, with giving you a short account of the Society, whom you propose to honour with your correspondence.

The Society was established as early as the year 1764. Agreeable to the statutes

* This interesting communication, was accidentally omitted to be inserted in its proper place, p. 260, immediately after the papers from the Netherlands.

when it was formed, its general aim was directed to the improvement of rural economy, forests, manufactures, arts, commerce, &c. This circle of action, too extensive for its confined powers, weakened them too much, and may be stated as the cause that so little advantage has hitherto been reaped from it. About that period, they had adopted in Germany, that false principle in political economy, of encouraging manufactures and commerce, before any aid was given to agriculture, which then was yet in a state of the most barbarous imperfection. In some provinces of Germany, the object had, for a certain limited time, been apparently obtained, by the force of despotic power, joined to monopoly, and much expence. Our government, however, has always been actuated with too great a share of humanity, to make use of similar coercive means, and has ever been too economical, to squander away its treasure to such little purpose. But our Society, dazzled by the splendid success of neighbouring countries, first made many fruitless attempts, before they were fully sensible that their powers were too feeble to oppose the progress of nature.

Several intelligent members of the Society, had long since been aware of this, but they were not able, before the year 1789, when his Majesty established a commercial college at Hanover, to carry the resolution, that the Society should merely confine themselves to the Improvement of Agriculture, and forego every thing concerning manufactures, arts, and commerce. At the same time it was resolved, to improve rather *practically* the tillage of the soil in our country, than the theoretical knowledge of husbandry; not to shine forth with attempting new discoveries, but to become useful, by introducing and promoting the cultivation of those articles which were sanctioned by experience.

You will ask, if, by our labours, we have obtained some real practical advantages? I think I may assert we have, in some particular instances, but not to any very great extent.

The culture of clover, which formerly was not known here, by distributing the seed gratis when first attempted, has been materially promoted; a more regular rotation of crops has been introduced; many trials of stall-feeding have been made; the number of fruit-trees has been augmented by forming nurseries for that particular purpose; several of our flocks have been improved by the introduction of Spanish rams; the division of commons has, in some particular districts, been brought about, through persuasion, reward, and the payment of expences attending it; the inclosure of cultivated fields, with hedges and stone walls, has been encouraged; and the system of flooding, or watering of meadows, has been introduced.

Yet all this ought to be considered, only as single instances, exhibited for imitation, and merely as a foundation from which an abundant harvest is afterwards to be expected. If even the powers of the Society were much greater than they actually are, yet we could do no more than give such examples. There are obstacles to the general cultivation of the country, the removal of which must be expected from a greater and more powerful quarter. The principal part of our lands still lies in common, not merely the pasture, but also the arable land. The right of pasturing flocks and cattle upon the stubble, belongs generally to such as are not owners of the fields. Hence the advantageous use of such lands can only in a few places be attempted.

The practicability, and final necessity, of a general division of the commons, are universally acknowledged. Every one is sensible, that this measure would prove advantageous, not only to the community at large, but also to every individual. The rights of property, however, are kept so sacred in this country, that before a division can be completed, the general consent of all must be obtained, and this is no easy matter. If, from among thousands, only one opposes the measure, either from a motive of mere caprice, or envy, or because his extravagant demands are not complied with, nothing can be done; and in this manner several large divisions, which had been already regulated and measured, have been frustrated by the opposition of one single wretched and invidious man, who had a share in the common.*

Most anxiously, therefore, do we wait for a royal decision, to determine and fix the principles upon which the division of commons shall be established, and by which, limits shall be assigned for the opposition of those, who either do not understand their own interest, or are guided by caprice. We know that our most gracious Sovereign intends to grant it, and that the states of the country are willing to lend their aid to so useful a work. The principles upon which such regulations ought to be founded are the less difficult, as we have already instances of them in some other provinces of Germany, where it has not been found impracticable to ascertain the respective interests of the sovereign, of the landlord, of the tithe-owner, and of the farmer; and the same might soon be settled here, by a set of men, well acquainted with the constitution of the country, and with rural economy.

There would not then be in all Europe, a district more susceptible of an extension

* It is singular, that a general law for dividing commons and common fields, should be as much wanted in the continental, as in the insular dominions of his Britannic Majesty. The time, it is to be hoped, is not far distant, when neither, on this ground, will have any cause to complain.

of culture, than the principality of Lunenburg. Its produce must in a short time be quadrupled, and its population doubled.

This regulation is anxiously wished for, not only by the intelligent farmer, but also by the citizens in the towns, by the land-owners, by men of learning and reflection, and by those who are intrusted by his Majesty with the government. It is well known, to all these different descriptions of persons, that as the provisions, for the towns at least, must be drawn from foreign countries, their price must necessarily be higher among us, than in any other province of Germany, and rises exorbitantly, each time the exportation of corn is prohibited in the adjacent countries.

In those few places, where, from time immemorial, the lands are either possessed as perfect unincumbered property, or where, by a happy general concord, they have been made such, we are able to evince the most convincing proofs of the highest degree of cultivation.

The two systems of rural economy, best proved by experience, and acknowledged to be the most perfect, are, *the plan of stall-feeding, and the Mecklenburg or Holstein Schlag, or Koppeln economy.* Our able agricultural writers, of whom we have an infinite number in Germany, have not as yet decided, which of these two systems deserves the preference. But this matter has long since been determined by the enlightened practical farmer.

The Koppeln or Schlag economy, consists in an equal partition of fields, into a certain number of portions, and in a fixed or regularly varied use of them, either for cultivation, meadow, or pasture. It differs according to the nature of the soil, and has from seven to thirteen portions, established upon certain determinate general principles. There is certainly no system of husbandry more regular, or more to be depended on, so far as it goes. The number of the oxen, of milch cows, the manure, the different kinds of ploughs, the sowing, the succession of crops, every thing is fixed in the most accurate manner. Every work has its proper time, and its regular succession, so as to be done with the smallest possible expence, either by the strength of men, or of cattle. The produce, unforeseen accidents, and unfruitful seasons excepted, is always certain. A possession of 20,000 acres is kept in order with the same ease as one of only 500. This system resembles a clock, which is wound up once a year by consulting the registers: the value of an estate, managed in this manner, and the rent it can afford, may be determined at once. The conditions on which the ground may be let, are, upon general principles, capable of being determined with such accuracy, that it is not in the power of the farmer to impoverish the land.

This system, therefore, is certainly the most eligible for the proprietors of extensive estates, whose principal aim is to draw a certain income from them, either by letting them out, or by farming them; without, however, being obliged to pay them any particular attention. Hence, it would probably meet with the most decided approbation of the proprietors of land in England, where, it is supposed that the real principles of the system are not yet universally known. Should this indeed be the case, and should the Board of Agriculture incline to have a full description of a system, so renowned in Germany, I shall be happy to lay down its principles, in a sketch which may easily be perused, as the greater part of the writings on that subject are very diffuse.*

But whoever wishes to draw the highest possible produce from his lands, though undoubtedly with a greater expence of money, labour, and attention; whoever chooses to employ a greater number of hands in the useful occupations of husbandry, and to keep a greater number of cattle to advantage, will, beyond a doubt, prefer the mode of stall-feeding.

The advantages of this system are founded upon the following incontrovertible principles.

1. A spot of ground, which, when pastured upon, will yield sufficient food for only one head, will abundantly maintain four head of cattle in the stable, if the vegetables be mowed at a proper time, and given to the cattle in a proper order.

2. The stall-feeding yields, at least, double the quantity of manure from the same number of cattle; for the best and most efficacious summer manure, is produced in the stable, and carried to the fields at the most proper period of its fermentation; whereas, when spread on the meadow, and exhausted by the air and sun, its power is entirely wasted.

3. The cattle used to stall-feeding, will yield a much greater quantity of milk, and increase faster in weight when fattening, than when they go to the field.

4. They are less subject to accidents, do not suffer by the heat, by flies and insects, are not affected by the baneful fogs which are frequent in Germany, and bring on inflammations; on the contrary, if every thing be properly managed, they remain in a constant state of health and vigour.

That I may explain these principles more accurately, I must beg leave to present

* This system, seems to be only a peculiar rotation of crops; a subject which has been no where more attended to than in England. It is extremely desirable, however, to know the opinions of the intelligent farmers of Germany, respecting so interesting an object of inquiry, and Dr. Thaer has been accordingly applied to for that purpose.

you with a short description of this system, as carried on at a farm called Essenrode, five miles distant from this place, belonging to our director, Baron de Bülow.

Before I proceed, it is proper to mention, that the lands contained in his farm, formerly lay scattered in single pieces among those which belonged to the villagers; and that the stubble and the ley lands were used in common for the feeding of their cattle and flocks. The farm produced a rent of only 1000 dollars; Mr. De Bülow persuaded the villagers to transfer to him, as his independent property, a common of about 700 acres, consisting of grass-land; in return for which, he made a cession to them of all his arable land, and gave up his right of feeding his cattle on the other commons with theirs. If a general division had taken place, he would have had double the quantity for his share; but his patriotic spirit was solely actuated by the desire of giving an example, in that beautiful country, of a well regulated system of rural economy, and of the advantages to be derived from a division of commons.

This extent of grass-land, which, as was discernible by its furrows, had been tilled many centuries ago, consisted of a very good clay soil. It was broken up by Mr. De Bülow, and laid out in seven partitions (Koppeln), close to one another, each consisting of ninety acres, and an additional one of sixty acres, adjoining to the farm.

The farm has, besides, 24 acres of meadow, and 22 acres of garden ground.

The smaller portion is destined partly for lucerne, and partly for cabbage, for roots and vegetables for sale.

The seven main partitions (Koppeln) are managed in the following manner:

One year, manured for beans, peas, cabbages, potatoes, turnips, linseed, &c.; 2. Rye; 3. Barley, mixed with clover; 4. Clover, to be mowed either 2 or 3 times; 5. Clover, to be mowed once at St. John's, then to be broken up, ploughed 3 or 4 times, and manured; 6. Wheat; 7. Oats.

The stock of cattle amounts in all to 100 head; namely, 70 heavy Friesland milch cows, or oxen to be fattened, which are *continually* kept in the stable, and about 30 head of draught oxen and young cattle.

A sufficient or rather plentiful supply of food for one head of cattle daily, if kept in a stable, consists upon an average of 130 lbs. of green, or 30 lbs. of dry clover, which answers the same purpose. Hence one head of cattle requires in 365 days 10,950 lbs. of dry clover, or about 100 hundred weight of 110 lbs. each; the portion of food being, according to this mode of feeding, alike both in summer and in winter. Hence 70 head require annually 7000 hundred weight of dry clover.

One acre of clover, mowed twice or thrice, yields 50 quintals, and one acre, mowed once, 25 quintals; consequently 90 acres of the former, and 90 acres of the latter, produce 6350 quintals. The deficient 650 quintals are completed by lucerne, and other vegetables, fit for food, from the smaller portion (Koppeln).

Besides all this, the offals of the vegetables of the ley-lands, the straw mixed with clover, and the young clover of the fifth portion, when laid down, joined to the stubble-feeding, will produce sufficient food for the draught oxen and the young cattle. The hay mowed from the meadows is preserved for the use of the horses.

Each head of heavy fat cattle, fed in the stable, if plenty of litter be given, yields annually sixteen full double cart loads of dung; 70 head therefore yield 1120 *fuder*. Add to this, 30 draught oxen and young cattle, at six *fuder* per annum, and the produce will be 1300 *fuder*.

A management of this kind, therefore, affords a triennial manuring per acre of 10 *fuder* of good stable dung; and as to this is united a complete and regular tillage, and succession of crops, a double produce of corn may at least be expected, thus:

			rix dol.
90 acres wheat yield at 20*	- 1800	at 1 -	1800
90 acres rye	20 - - 1800	- 24 -	1200
90 acres barley	24 - 2160	- - 24 -	1260
90 acres oats	36 - - 3240	- 12 -	1080
90 acres manured ley-crop, and 30 acres in the small portion (Koppeln) 120 acres at 15	- -	-	1800
The heavy Friesland cows, fed with the same plenty both winter and summer, or the oxen that are yearly shut up twice in the stables, fattened, and sold at 40 rix dollars a head, produce	- -		2800
		Thus the farm produces	9940†

That we may be able to ascertain the relative proportion in point of produce, of our two most renowned systems of rural economy, we shall now consider the same farm, as managed after the Koppeln system of Mecklenburg.

* The translator could not make out what this weight or measure was.

† In foreign computations the value of a rix dollar varies, but is, in general, about three shillings sterling; in Hanover it is three shillings and sixpence. *Fuder*, signifies a cart load.

According to the quality of its soil, which is very good, yet stands in need of manuring, it ought to be divided into nine portions, of 77 acres each; the reasons for which will soon appear.

These are, according to experience, most advantageously appropriated in the following manner.

1. Fallows ploughed during the whole summer, and left unsown; 2. wheat unmanured; 3. barley; 4. manured ley land, with ley-crop; 5. rye; 6. oats with clover; 7. clover once cut, then pastured; 8. pasture; 9. pasture.

By this mode of management, 77 acres are manured every ninth year, each acre with 10 *fuder*. As one head of grazing cattle yields eight *fuder*, 97 head ought to be kept. Each head, on this soil, requires 2 acres for its pasture; consequently 97 head require 124 acres, or two and a half Koppeln. Hence follows the division into nine portions mentioned above.

It may be admitted, that among these cattle there are about 80 milch cows, the rest draught oxen. This kind of economy seldom rears young cattle, but buys them. The cows are of the smaller breed, or else the pasture would not be sufficient for them. During the winter they live upon nothing else but straw; for what little there is of clover hay is destined for the draught oxen; hence it comes that they do not produce more than ten rix dollars a head. - - *rix dollars* 800

Though by this system the land is manured only once every nine years, which, according to the system of stall-feeding, is done every third year; yet this is made up in such a manner, by a three years' rest, and the ley left quite unsown, that the return of the corn may be admitted at the same rate, but not higher; consequently,

77 acres wheat yield at	20	-	-	1540	-	at 1	-	1540
77 acres rye	- 20	-	-	1540	-	24	-	1026⅔
77 acres barley	- 24	-	-	1848	-	- 21	-	1078
77 acres oats	- 36	-	-	2772	-	12		924
77 acres ley-crop	- 15	-		-		-		1155
						produce of the farm		6533⅓
From this ought to be deducted for the expence of house-keeping, &c. nearly						- - -		1500
						Remains clear produce		5033⅓

But as such complaints are made of the expences of housekeeping, &c. attending the system of stall-feeding, though in this case the young cattle are not bought, as in the other, which is a considerable saving; yet we will admit the highest possible sum, viz. the double, or 3000 rix dollars, to be deducted from the *general produce of* 9940 *rix dollars.*

Hence there remains of clear profit by the system of stall-feeding 6940 rix dollars. Consequently it produces, upon 700 acres, a greater profit than the Koppeln economy of Mecklenburg, amounting to 1906$\frac{1}{3}$ rix dollars; and every acre of its land is employed at a greater advantage of 2$\frac{2}{3}$ rix dollars.

By this calculation, which may vary in single points, but which upon the whole is proved by experience, and consequently may be depended upon, one would think that this system of rural economy must become general, wherever it is known; yet there are few farms of any consequence managed in this manner, in the north-eastern part of Germany. In our country, the number of wealthy people, who at the same time are enlightened and divested of prejudice, is too small; and besides possessions distinct by themselves, are very scarce. In the countries of Mecklenburg and Holstein, there is indeed a vast number of rich and attentive husbandmen, but the farms in those countries are rather too extensive, and the people of the lower class are, on account of the servitude which still prevails there, few and indolent. It cannot therefore be expected, that this kind of economy, which demands much greater exertions, should be introduced there. Besides, it is believed in those regions, that the perfection of rural economy has been already attained.

As a preference is but reluctantly given to such things as a person does not incline to undertake, objections, ten times repeated, are repeated again and again, to discourage the attempt. A few cases, in which this system of economy would not answer, are chiefly referred to. But it is plain, that the managers of the estates, and the people employed thereon, were averse to the measure, and united to crush it; or, that on the first outset the aim was missed, either by parsimony or rashness; that there was not a sufficient stock of clover hay, or that it was mismanaged when made; in short, that they had been negligent and careless in their process.

This sort of husbandry does not admit of any material errors, and suitable preparations ought to be made against every accident that is likely to befall it. If once the requisite stock of clover should happen to fail, the cattle used to abundance of food, will waste away in a manner beyond all possible recovery. If, on account of

the deficiency of food, the herds be lessened in number, the lands will be exhausted by want of manure. If to obviate the want of food, a portion is suffered to lie longer for raising food, than it ought agreeably to the system above recommended, there will be a want of straw, which is so necessary for litter, and the absence of which is extremely pernicious to the health of the cattle.

As in some years, though seldom, the quantity of food produced may be reduced to only one half, the prudent farmer should endeavour to keep one half of it, and likewise one half of his straw, from one year to another, and ought not to suffer himself to be tempted by any price, be it ever so high, to sell it. As this system is on so great a scale, great difficulties must be conquered; and it requires a fortune adequate to the size of the estate, to carry it on to perfection.

The objection, that this mode of feeding cattle is not agreeable to nature, and consequently must prove injurious to them, is theoretically the most apparent. Yet it is sufficiently contradicted by experience, whenever the necessary precautions are taken. In a small farm, which I carry on in this manner, at a country house a quarter of a mile from town, and where from eighteen to twenty head of milch cows are kept, and fed in a stable, none were ever materially ill, none ever miscarried, nor was there ever any left barren. Mr. De Bülow can attest the same thing, on a greater scale. The cattle, which in our country graze in the fields, are, on the other hand, exposed to many accidents.

It is self-evident, that the country gains most by stall-feeding, on account of the greater production, and the more extended employment of men.

I have dwelt rather longer upon this system of rural economy, because, though in the English writers on agriculture, I have indeed met with some remarks relative to the stall-feeding of cattle, yet I have seen none upon the system of economy built thereon: and in the pamphlet herewith sent, which I wrote a few years ago, at the desire of our Society, for the use of the husbandmen of Lunenburg, you will find the most necessary rules for stall-feeding detailed. It has already produced such beneficial effects, that at present, you will find from six to eight head of cattle in the stable of many a peasant, and the corn fields much improved, by the greater quantity of manure they furnish.

I shall now proceed to reply to the several questions and orders, with which you have been pleased to favour us.

The Siberian buck-wheat has been ordered, and should it not arrive before the

departure of this letter, yet it will soon follow. I made a trial of it myself, six years ago, but I have again left it off, as several of my acquaintance who are farmers have also done. It bears no comparison to the common wheat, either in point of produce, or in regard to keeping the land clean. On the contrary, the weeds will shoot prodigiously the second year, where it does not stand thick and close. Neither is it economical to let buck-wheat continue more than one year upon the same land, as it is to be considered merely, as a crop intended for improving the land by change. It likewise suffers by the frost in spring; it will indeed shoot again, but then it will never stand close.

We send herewith some sprigs of the largest apple known in this country. It will grow to the size of a child's head. It is here called the large *breck-apple*.

Our Society most humbly thank you, for the communication of the General Views of the Agriculture of the different Counties, and the other papers printed by the Board. They have inspired us with the greatest interest and desire to see the remainder; and therefore we intreat you, to present us, from time to time, with their continuation.

CONCLUSION TO PART IV.

Thus it appears, that the Board of Agriculture has already established a correspondence, with almost every country whence useful Agricultural Information could be expected, with the exception of the three powers with whom we are now at war, namely, France, Spain, and Holland: and that by continuing to carry on the same extensive correspondence, the Board may certainly become the general centre, of every species of knowledge, connected with the cultivation of the soil, and its productions. No institution can wish to be placed in a more respectable situation: and if similar establishments are formed in other countries, with which an intercourse may be kept up (which is likely to be the case, at least in the new empire of America), what improvements may not be expected, both in Agriculture, and in all the useful arts connected with it.*

* M. Teissier, that celebrated Agriculturist, in his Annales de l'Agriculture Françoise, No. VII. thus states the idea he entertains of the exertions of the Board of Agriculture: " Il n'est pas une " personne sage, et amie de l'humanité, qui n'applaudisse, comme moi, à des opérations si bien con- " certées, et si promptement executées." And in another passage: " Les vrais citoyens, les hommes " qui jugent sainement, les amis solides de la France, ne verront pas, sans une noble jalousie, l'An- " gleterre former un department d'Agriculture."

APPENDIX

TO THE FIRST VOLUME OF COMMUNICATIONS;

CONNECTED WITH

PART II. ON COTTAGES.

I. *PISÉ, or the Art of Building strong and durable Walls, to the Height of several Stories, with nothing but Earth, or the most common Materials. Drawn up and presented to the Board of Agriculture, by* Henry Holland, *Esq.*

INTRODUCTION.

In the year 1791 a work was published at Paris by M. François Cointeraux, containing an account of a method of building strong and durable houses, with no other materials than earth; which has been practiced for ages in the province of Lyons, though little known in the rest of France, or in any other part of Europe. It appeared to be attended with so many advantages, that many gentlemen in this country, who employ their leisure in the study of rural economy, were induced to make a trial of its efficacy; and the event of their experiments has been of a nature to make them wish, by all possible means, to extend the knowledge and practice of so beneficial an art. With a view to promote this desirable end, the account contained in the following pages has been extracted from the French work, and it will be found to contain every necessary instruction, by those into whose hands the original may not have fallen, or who, being unacquainted with the language, may have been prevented from consulting it. The appearance of those wretched hovels which are built with mud in some parts of England, will perhaps dispose many persons, to doubt the strength and durability of houses, which are composed of no other materials than earth. The French author says, "The possibility of raising the walls of houses "two or even three stories high, with earth only, which will sustain floors loaded with the "heaviest weights, and of building the largest manufactories in this manner, may astonish every "one, who has not been an eye witness of such things." But it is hoped that a description of this manner of building will sufficiently explain the reason of its superiority.

The word *pisé* is a technical term made use of in the country, where the work about to be described is in common practice; and it has been retained in this translation, because it cannot be rendered by any adequate word in the English language.

CHAPTER I.

Of Pisé and its Origin.

Pisé is a very simple manual operation; it is merely by compressing earth in moulds or cases, that we may arrive at building houses of any size or height. This art, though at present confined to the single province of the Lyonese in France, was known and practiced at a very early

period of antiquity, as appears from a passage in Pliny's Natural History, book 34. chap. 14, which is exactly descriptive of this manner of building.

Mr. Goiffon, who published a treatise on Pisé in 1772, is of opinion that the art was practiced by the Romans, and by them introduced into France; and the Abbé Rozier, in his Journal de Physique, says, that he has discovered some traces of it in Catalonia; so that Spain, like France, has a single province in which this ancient manner of building has been preserved. The art, however, well deserves to be introduced into more general use. The cheapness of the materials which it requires, and the great saving of time and labour which it admits of, must recommend it in all places and on all occasions; but the French author says, that it will be found particularly useful in hilly countries, where carriage is difficult, and sometimes impracticable; and for farm buildings, which, as they must be made of considerable extent, are usually very expensive, without yielding any return.

CHAPTER II.

Of the Implements necessary for building in Pisé.

Besides the common tools, such as spades, trowels, baskets, watering pots, a plumb rule, a hatchet, hammer and nails, the only implements required for building in pisé are a mould and a rammer, of which it will be necessary to give a particular description.

The following is a list of their several parts, as they are delineated in Plates XLVIII. XLIX. and L.

PLATE XLVIII.

Fig. 1. One side of the mould, seen on the outside.
2. The other side of the mould, seen within side.
3. Head of the mould, seen without.
4. The other face, seen within.
5. Wedges.
6. A round stick, called the wall-gage.

PLATE XLIX.

7. Posts to be set upright, but seen flatwise, with its tenon.
8. The same on its back, also with its tenon.
9. Joists in which the mortises are cut, seen flat.
10. The same, with the side and bottom seen.
11. A mould put together, in which are seen all the parts abovementioned, and also a small rope.

PLATE L.

12. The rammer (or *pisoir*) for ramming the earth in the mould.
13. The same on a large scale, seen on its side.
14. Plan of that instrument, seen on the top.

For the construction of the mould, take several planks, each ten feet long, of light wood, in order that the mould may be easy to handle; deal is the best, as being least liable to warp, to prevent which the boards should be straight, sound, well seasoned, and with as few knots as possible.

Plate XLVIII.

Fig. 1

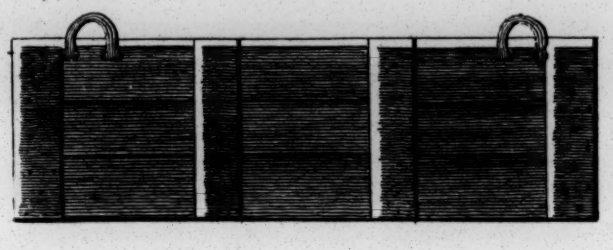


Fig. 2

Fig. 4

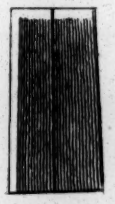


Fig. 3

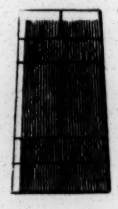


Fig 6

Fig. 5

Plate XLIX.

Fig. 11

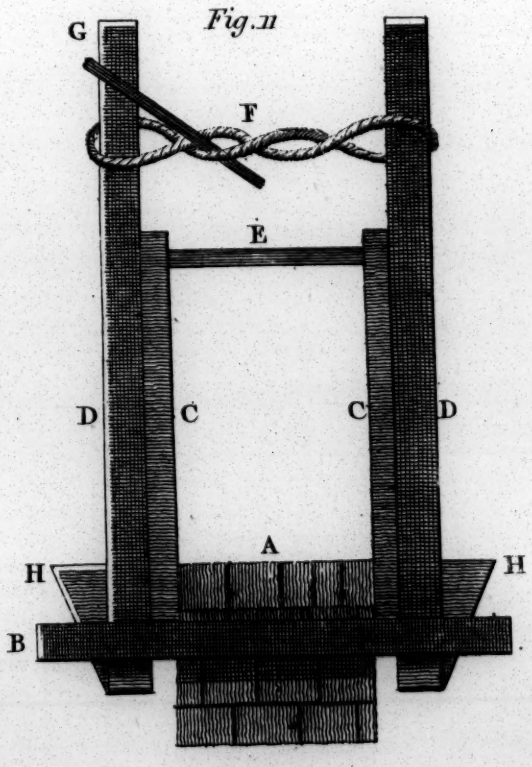
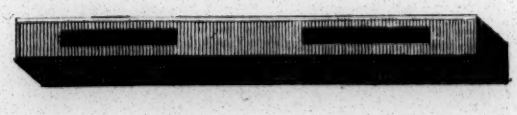


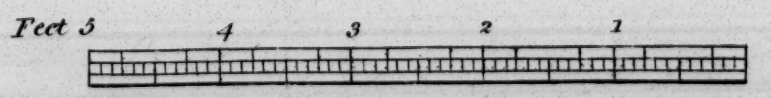
Fig. 7

Fig. 8

Fig. 9

Fig. 10





Neele sc. Strand.

To face

Plate LII.

Fig. 16

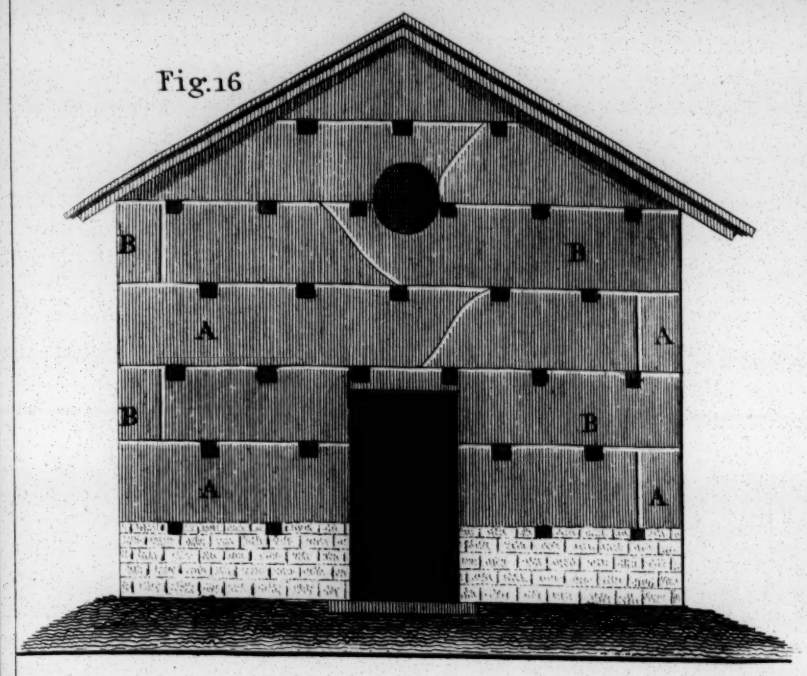


Fig. 17

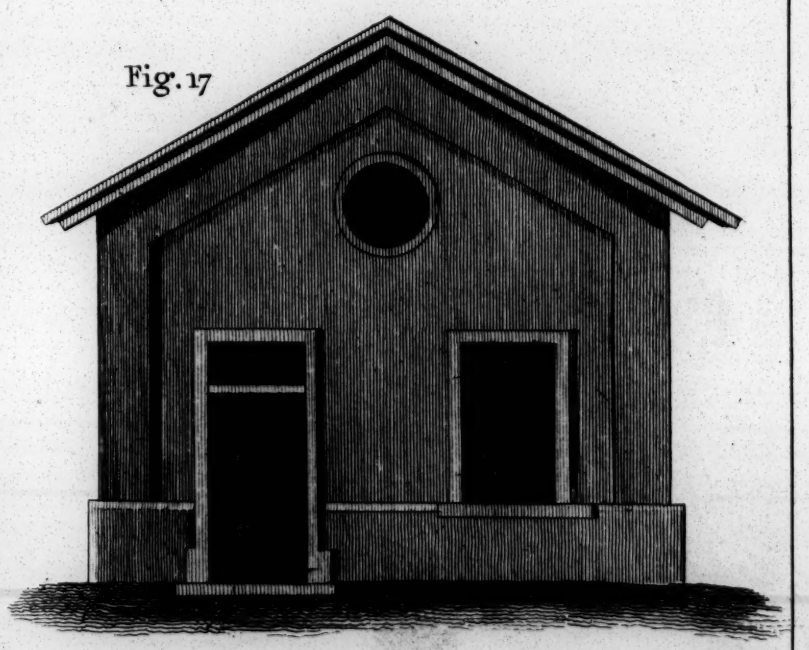


Plate L.

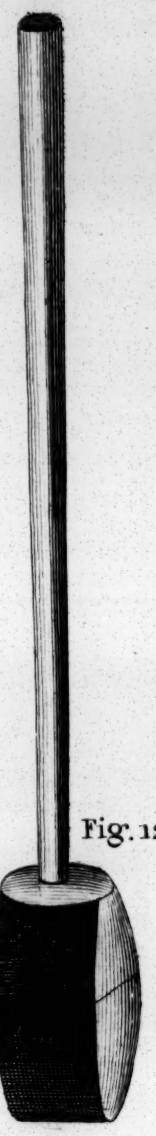


Fig. 12

12 9 6 3 Inch.s

Fig. 13

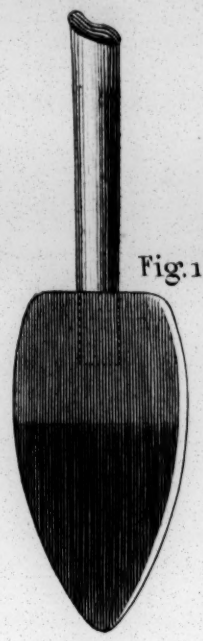
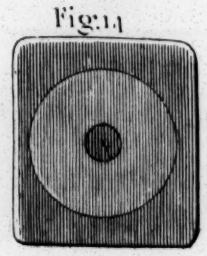


Fig. 14



12 9 6 3 Inch.s

Plate LI.

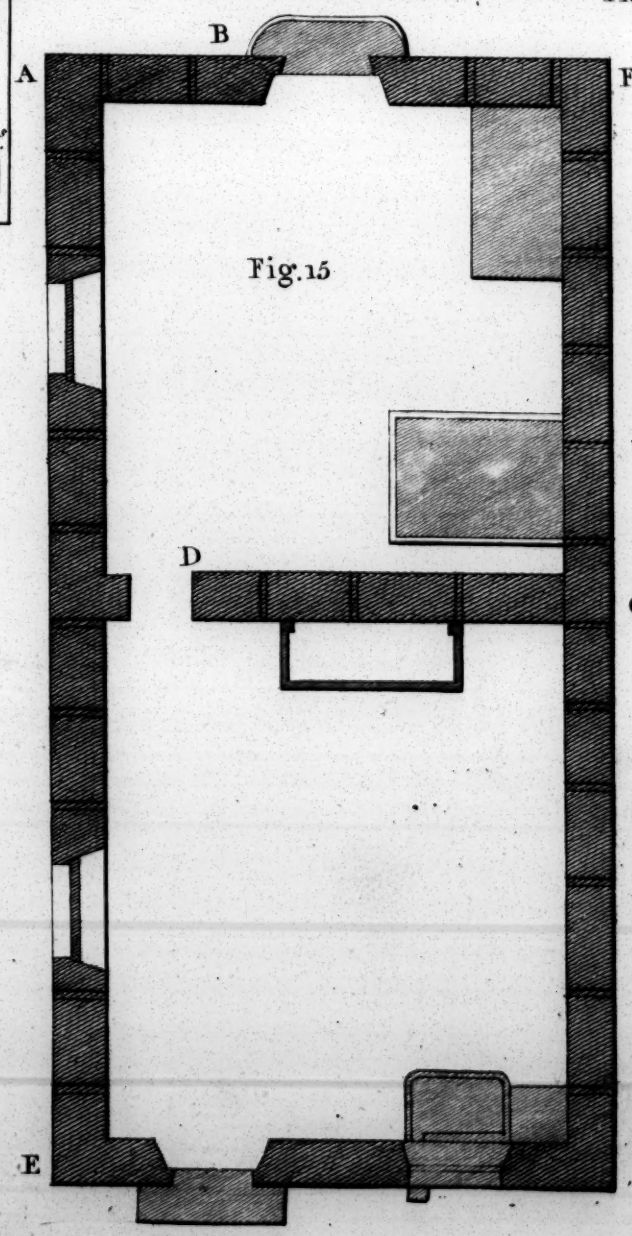


Fig. 15

1 2 3 4 5 6 7 8 9 10 Feet

Neele sc. Strand

Let them be ploughed and tongued, and planed on both sides. Of these planks, fastened together with four strong ledges on each side, the mould must be made, two feet nine inches in height; and two handles should be fixed to each side, see fig. 1. and 2, Plate XLVIII. The head of the mould which serves to form the angles of the building, must be made of two narrow pieces of wood, ploughed, and tongued, and ledged; its breadth eighteen inches, and height three feet; and it should be planed on both sides. See Plate XLVIII. fig. 3 and 4, where it will be remarked, that this part of the mould diminishes gradually to the top, in order that the wall may be made to diminish in the same degree.

All the boards and ledges here mentioned must be, after they are planed, something more than one inch thick.

The wedges, Plate XLVIII. fig. 5, must be an inch thick, and from eight to twelve inches high; and as to the gage, fig. 6, it must be cut in length equal to the thickness of the wall you mean to erect.

The eight ledges that are necessary to secure the two large sides of the mould, serve also to receive eight upright posts, standing on four joists.

The posts, Plate XLIX. fig. 7 and 8, may be made either of wood sawed square, or of round wood of any kind; so that one may use indifferently the ends of rafters, joists, small trees, or their branches. These posts are to exceed the height of the mould by eighteen inches; they must therefore be about five feet high, including their tenons (which should be six inches long), and three by four inches. That part which is to bear against the ledges of the mould must be made flat and straight, the other sides need not be worked with so much truth.

The joists may be of the same sort of stuff, three feet six inches long, three inches and a half broad, and three inches thick. On the broad part must be made the two mortises (as marked Plate XLIX. fig. 9) ten inches and a half long, and rather more than an inch wide, and at each end three inches and a half must be left beyond the mortises, so that the interval between them will be fourteen inches. These dimensions must be observed, in order that the two sides of the mould may incline towards each other, and the thickness of the wall be gradually diminished, till it is reduced to fourteen inches at the roof.

The dimensions for the joists then are as follow:	ft.	inch.
The two ends, remaining beyond the mortises, three inches and a half each -	0	7
The two mortises, ten inches and a half each - - -	1	9
The interval between the mortises - - - - -	1	2
Total length of the joist -	3	6

The most simple things are sometimes difficult to be understood without being seen; an elevation therefore of this whole machine has been annexed, Plate XLIX. fig. 11, and the following is a list of its several parts, enumerated in the same order that the workmen must follow when they erect the mould.

Elevation of the Mould on a Wall.

A, a stone foundation eighteen inches thick, on which a wall of earth is to be raised.

B, joists placed across the foundation wall.

CC, the two sides of the mould, including between them three inches of the foundation wall.

DD, the two upright posts, the tenons of which fit into the mortises of the joist.

E, wall gage, which fixes the width of the mould at the top, and which is shorter than the thickness of the wall at bottom, to regulate the diminution of the wall to be erected.

F, a small cord something less than half an inch diameter, making several turns round the posts.

G, a stick, which by being wound round, fastens the cord, and holds the posts tight together.

HH, wedges which enter into the mortises in the joists, and keep the posts and the mould firmly fixed against the wall.

Such is the process of erecting the mould; a contrary order must be observed in taking it to pieces. The rope must be loosened, the wedges taken out, and the posts, the mould, and the joist removed, in order to refix the whole again.

The instrument with which the earth is rammed into the mould, is a tool of the greatest consequence, on which the firmness and durability, in short the perfection, of the work depends. It is called a *pisoir*, or rammer; and though it may appear very easy to make it, more difficulty will be found in the execution than is at first apprehended. A better idea of its construction may be formed by examining Plate L. fig. 12, 13, and 14, in which it is delineated, than any words can convey. It should be made of hard wood, either ash, oak, beech, walnut, &c. or what is preferable, the roots of either of them.

CHAPTER III.

Method of Working.

Let us not confound pisé with that miserable way of building with clay or mud mixed with hay or straw, which is often seen in country villages. Though some have been unable or unwilling to distinguish between them, nothing in reality can be more different. Those wretched huts are built in the very worst manner that could be imagined; whereas pisé contains all the best principles of masonry, together with some rules peculiar to itself, which are now to be explained. Plate LI. fig. 15, represents the plan of a house, the building of which will be regularly described, according to the method of pisé.

To begin with the foundation; this may be made of any kind of masonry that is durable, and must be raised to the height of two feet above the ground; which is necessary to secure the walls from the moisture of the earth, and the splashing of the rain, which will drop from the eaves of the roof. When these foundation walls are made level, and eighteen inches thick, mark upon them the distances at which the joists are to be set, for receiving the moulds; those distances should be three feet each from centre to centre. Each side of the mould being ten feet long, will divide into three lengths of three feet each, and leave six inches at each end, which serve to lengthen the mould at the angles of the house, and are useful for many other purposes. After having set the joists in their places, the masonry must be raised between them six inches higher, that is, to a level with the joists; there will, therefore, upon the whole, be a base of two feet and a half, which in most cases will be found more than sufficient to hinder the rain, frost, snow, or damp, from injuring the walls. Raise the mould immediately on this new masonry, placing it over one of the angles of the wall. The manner of raising the mould

has been already described; the head of it, which is to be placed against the angle, should have eighteen inches in breadth at the bottom, and only seventeen inches and a half at the top; thus the sides of the mould will incline towards each other, and produce that diminution in the thickness of the wall, which is usual in buildings of this nature. The wedges must then be driven in, and the posts well fixed by cords, and the head of the mould secured by iron pins; the preparations are then complete, and the workmen may begin.

A workman should be placed in each of the three divisions of the mould, the best workman being placed at the angle. He is to direct the work of the other two, and by occasionally applying a plumb-rule, to take care that the mould does not swerve from its upright position. The labourers who dig and prepare the earth, must give it in small quantities to the workmen in the mould, who, after having spread it with their feet, begin to press it with the rammer. They must only receive at a time so much as will cover the bottom of the mould to the thickness of three or four inches. The first strokes of the rammer should be given close to the sides of the mould, but they must be afterwards applied to every other part of the surface; the men should then cross their strokes, so that the earth may be pressed in every direction. Those who stand next to one another in the mould should regulate their strokes so as to beat at the same time under the cord, because that part cannot be got at without difficulty, and must be struck obliquely; with this precaution, the whole will be equally compressed. The man at the angle of the wall should beat carefully against the head of the mould, and for the sake of the appearance, or perhaps to increase the strength of the building, it is usual to spread every six inches high a layer of mortar near the head, in imitation of the joints of stone-work. Care must be taken, that no fresh earth is received into the mould till the first layer is well beaten, which may be ascertained by striking it with the rammer: the stroke should leave hardly any print on the place. They must proceed in this manner to ram in layer after layer, till the whole mould is full. When this is done, the machine may be taken to pieces, and the earth which is contained will remain firm and upright, about nine feet in length, and two feet and a half in height. The mould may then be replaced for another length, including one inch of that which has first been completed; the regular manner of joining the different lengths may be seen in the geometrical elevations, Plate LII. fig. 16, and particularly in Plate LIII. fig. 18, where it will be observed, that no joints are left in this work, as the different lengths are united, and made to press one on the other. In the second length, and most of the following, the head of the mould is useless; it is only made use of at the angles.

When the workmen have gone round the whole building, taking the mould to pieces and putting it together again successively, they must begin upon the partition wall, marked C in Plate LI. Here the head of the mould must be used, as the door jambs are squared like the angles of the wall. The jamb next to the exterior wall, which is too narrow to be made of pisé, can easily be made of wood, brick, or stone.

The first course being thus completed, we proceed to the second; and here it must be observed, that if in laying the first course we begin with one angle, as the angle A, in Plate LI. and proceed with the work towards E, we must, for the second course, begin with A, and proceed towards B, and so in each successive course we must proceed in a direction contrary to that of the preceding. It may easily be conceived, that with this precaution the joints of the seve-

ral lengths will be inclined in opposite directions, which will contribute very much to the firmness of the work. There is no reason to fear overcharging the first course with the second, though but just laid; for three courses may be laid without danger in one day; mark the grooves for receiving the joists in the first course, at the distance of three feet from one another, but not immediately over the former grooves, but over the middle points between them; see Plate LIII. fig. 18. These grooves must be cut with a pick-axe, and the second course completed in the same manner as the former, except that it must proceed in a contrary direction, as was before observed, and that the head of the mould and wall-gage must be diminished, in order that the same inclination of the sides to one another, that was given to the first course, may be preserved in this second.

It must, however, be remarked, that this second course is not to be continued without interruption like the first, as it is necessary that the partition wall should join or bond into the exterior wall; or rather, that all walls in the building, whether outside or partition walls, which meet at an angle should cross each other at every course. In pursuance, therefore, of this rule, when the work has been advanced from A and C, Plate LI. or perhaps not quite so far as C, leave the exterior wall, and turn the mould to the partition, applying the face of it to C. This will appear more clearly by observing the letter G in Plate LIII. When the work has been carried on along the partition wall as far as the door, bring back the mould to the part which remained unfinished in the exterior wall, marked C in Plate LI.; and after having filled up that space, carry the mould on beyond the partition wall, and complete the course. The reason why the partition wall on the side opposite to C, Plate LI. is not to be connected in the same manner with the interior wall, has already been given, viz. that it ought to be made of wood, or brick-work, and not of pisé; but the third course must be carried over the door, and join into the wall, as directed on the other side.

This description of the two first courses is equally applicable to all the others, and will enable any person to build a house, with no other materials than earth, of whatever height and extent he pleases.

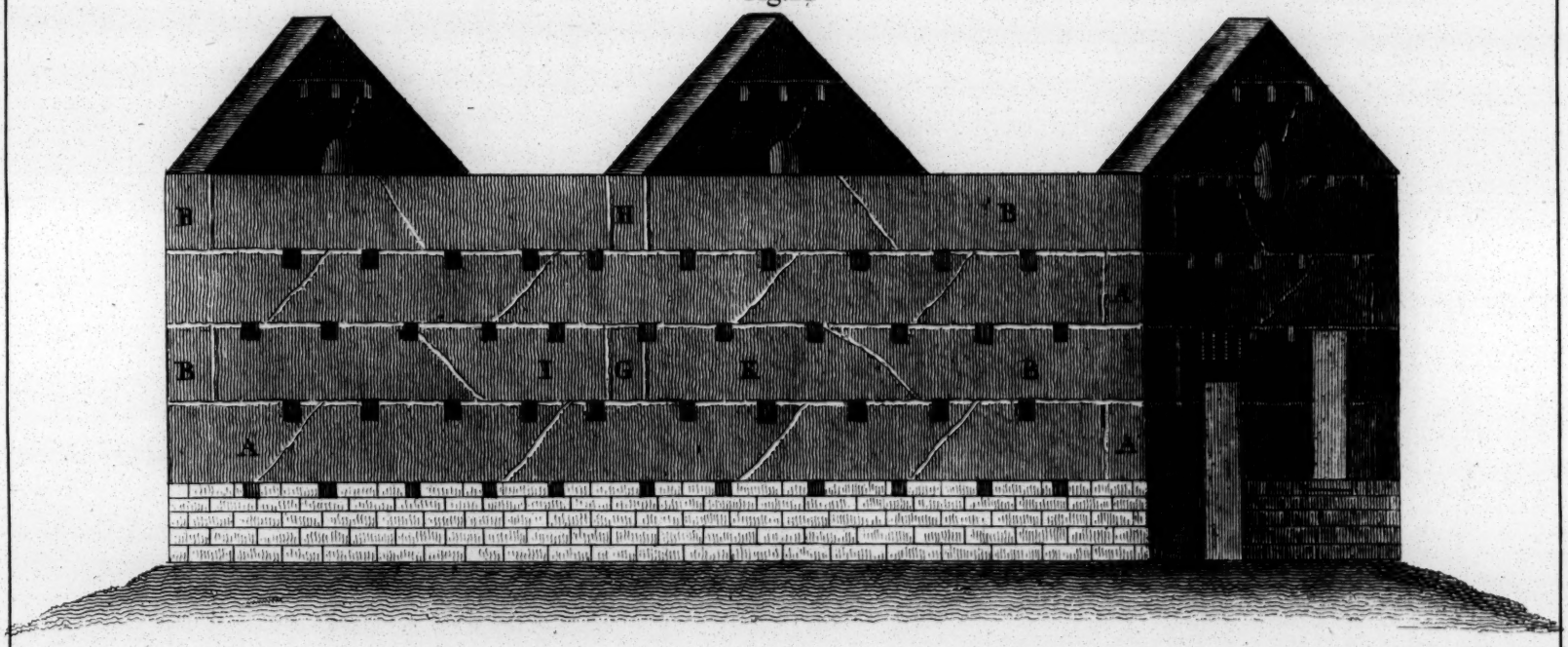
With respect to the gables, they cannot be crossed, as they are detached from one another; but as their height is so inconsiderable, and they are besides connected together by the roof, this is not of any consequence. They may be made without any difficulty, by merely making their inclination in the mould, and working the earth accordingly.

It has been observed, that each course will be two feet and a half high, if the mould is two feet nine inches; for the mould must include three inches of the course beneath. For this reason the grooves are made six inches deep, though the joists are only three inches in thickness. If the directions which have been given for diminishing the thickness of the walls are observed, that thickness will be reduced to fifteen inches at the roof, in a house (like that of which a design is annexed) consisting of six courses; for in each course there will be an inclination of half an inch. The gables might have been reduced to fourteen inches only in thickness, as an interval of fourteen inches only was left between the mortises of the joists: and by increasing or diminishing that interval, the thickness of the walls may be regulated at pleasure.

Such is the method of building which has been practiced in the Lyonnese for many centuries.

Plate LIII.

Fig:18



Neale sc. Strand.

Plate LIV.

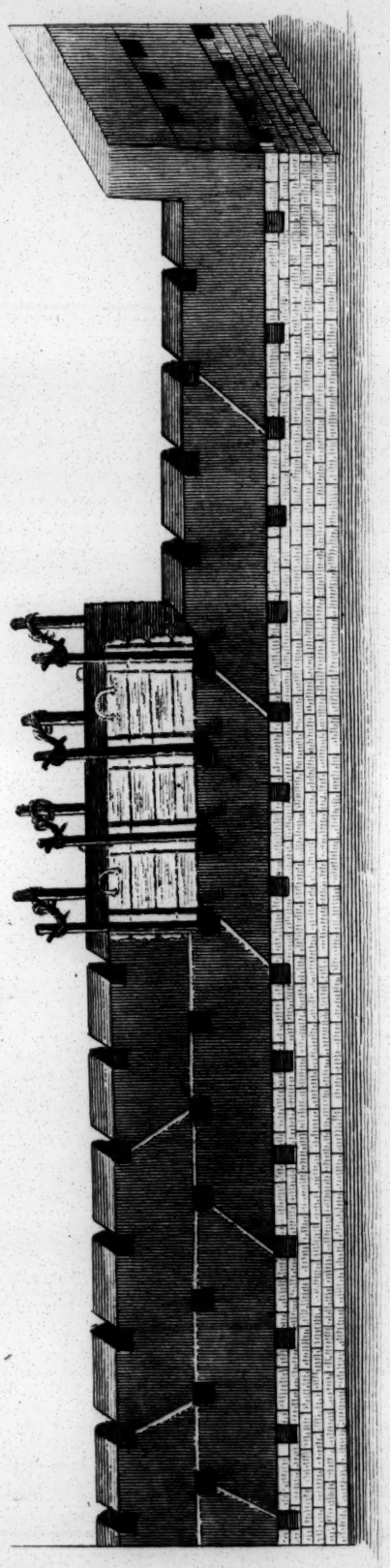


Fig. 19

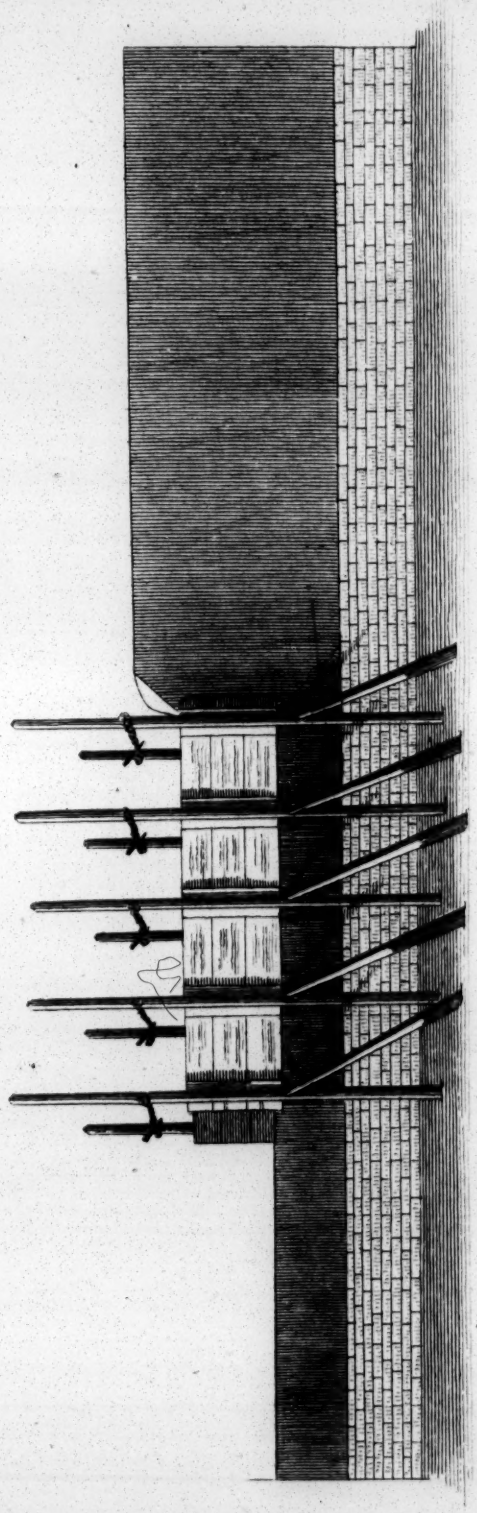


Fig. 20

Neele sc. Strand.

Houses so built, are strong, healthy, and very cheap; they will last a great length of time, for the French author says, he had pulled down some of them, which, from the title-deeds in the possession of the proprietors, appeared to be 165 years old, though they had been ill kept in repair. The rich traders of Lyons have no other way of building their country-houses. An outside covering of painting in fresco, which is attended with very little expence, conceals from the eye of the spectator the nature of the building, and is a handsome ornament to the house. That method of painting has more freshness and brilliancy than any other, because water does not impair the colours. No size, oil, or expence is required, manual labour is almost all it costs, either to the rich or poor. Any person may make his house look as splendid as he pleases, for a few pence laid out in red or yellow ochre, or in other mineral colours.

Strangers who have sailed upon the Rhone, probably never suspected that those beautiful houses, which they saw rising on the hills around them, were built of nothing but earth; nay, many persons have dwelt for a considerable time in such houses, without ever being aware of their singular construction. Farmers in that country generally have them simply white-washed, but others, who have a greater taste for ornament, add pilasters, window-cases, pannels, and decorations of various kinds. Plate LII. fig. 17. represents the house of the poorest inhabitant the Lyonnese.

There is every reason for introducing this method of building into all parts of the kingdom; whether we consider the honour of the nation as concerned in the neatness of its villages, the great saving of wood which it will occasion, and the consequent security from fire, or the health of the inhabitants, to which it will greatly contribute, as such houses are never liable to the extremes of heat or cold. It is attended with many other circumstances that are advantageous to the state, as well as to individuals. It saves both time and labour in building, and the houses may be inhabited almost immediately after they are fininished; for which latter purpose the holes made for the joists should not be closed up directly, for the air, if suffered to circulate through them, will dry the walls more speedily.

CHAPTER IV.

Method of forming the Openings for the Doors and Windows.

The openings for the doors and windows must be left at the time of building the walls. This may be done by placing within the mould either two or one of the heads (such as is represented, Plate XLVIII. fig. 3, and 4), as may be necessary, wherever the wall is to terminate and the opening commence. They should be made sloping a little, in order to leave room for the frames and sashes.

The exterior decorations of the windows and doors are usually made, by the rich, of stone or brick, and by the poor, of wood, which latter have a bad effect on the appearance of the house, as wood will never unite well with pisé-work; and notwithstanding the greatest precautions, the exterior covering will break and fall off the wood; whereas stone or brick-work unite perfectly with the pisé, and retain their plaster, and of course the paint, of which it forms the ground. The chimney-pieces of brick or stone are laid and united with the walls in the same

manner as in common buildings; and the flues are also very firmly connected with them, being made of brick-work. But a very particular advantage is, that the apartments may be very handsomely finished, without making any jambs to the inside doors, either of stone, brick, or wood. The finishing of the earthen wall will make jambs unnecessary; and why should the expence of any other finishing be incurred, when the doors may be hung on the grounds, or wainscot of the apartment?

CHAPTER V.

On the Effects of beating or compressing Earth, Cement, or other Compositions used in Building.

Beating, or compression is used in many different sorts of work; the ancients employed it in making their rough walls; the Italians employ it for the terraces which cover their houses: the Moors for all their walls; the Spaniards, the French, and others, for some of the floors of their apartments. The intent of the ancient architects, when they recommended the beating of cement and other compositions used in building, was to prevent them from shrinking and cracking; and it is employed for the same purpose in walls which are made of earth. The beater, by repeated strokes, forces out from the earth the superfluous water which is contained and closely unites all the particles together, by which means the natural attraction of those particles is made powerfully to operate, as it is by other natural causes in the formation of stones. Hence arises the increasing strength and astonishing durability which houses of this kind are found to possess.

CHAPTER VI.

On the Description of compressed Earth.

Upon beating a small portion of earth, and weighing it immediately afterwards, it was found to contain thirty-nine pounds and a half; fifteen days after, it had lost four pounds and a quarter; in the space of another fifteen days it lost but one pound; and in fifteen days after that its weight diminished only half a pound. In the space of about forty-five days the moisture was completely evaporated, and its weight was diminished about one-eighth; consequently only one-eighth of the whole mass was occupied by moisture, and this small proportion cannot at all affect the solidity and consistency of the earth so treated. This experiment is also sufficient to shew the difference between this kind of building, and that vulgar kind, called in England, "mud-"walling;" the latter cannot be executed without adding a great deal of water, to soften the materials employed, which entirely destroys their consistency; the water, which occupies a considerable space in the mud, leaves, in evaporating, an infinite number of pores or little cavities, and thus the walls become weak and brittle, and incapable of supporting several stories, or such ponderous weights as the beaten earth or pisé can sustain.

CHAPTER VII.

On the Height of Pisé Walling that may be executed in one Day.

In one single day three courses of about three feet each may be laid one over the other; so that a wall of earth of about eight or nine feet, or one story high, may be raised in one day. Experience has proved, that as soon as the builders have raised their walls to a proper height for flooring, the heaviest beams and rafters may without danger be placed on the walls thus newly made; and that the thickest timber of a roof may be laid on the gables of pisé, the very instant they are completed.

CHAPTER VIII.

On Earth proper for Building.

1st. All earths in general are fit for that use, when they have not the lightness of poor lands, nor the stiffness of clay. 2dly. All earths fit for vegetation. 3dly. Brick-earths; but these, if they are used alone are apt to crack, owing to the quantity of moisture which they contain. This, however, does not hinder persons who understand the business from using them to a good purpose. 4thly. Strong earths, with a mixture of small gravel, which for that reason cannot serve for making either bricks, tiles, or pottery. These gravelly earths are very useful; the best pisé is made of them. These general principles may suffice, without overburdening the memory of the reader; and from the following marks may be known, what earths are fittest to be employed by themselves. When these have been described, it will remain to point out such as must be mixed with others, in order that they may acquire the necessary quality.

The following appearances indicate that the earth in which they are found is fit for building: when a pick-axe, spade, or plough brings up large lumps of earth at a time; when arable lands lies in clods or lumps; when field-mice have made themselves subterraneous passages in the earth; all these are favourable signs. When the roads of a village, having been worn away by the water continually running through them, are lower than the other lands, and the sides of those roads support themselves almost upright, it is a sure mark that the pisé may be executed in that village. One may also discover the fitness of the soil, by trying to break with one's fingers the little clods of earth in the roads, and finding a difficulty in doing it; or by observing the ruts of the road, in which the cart-wheels make a sort of pisé by their pressure; whenever there are deep ruts on a road, one may be sure of finding abundance of proper earth.

Proper earth is found at the bottom of the slopes of low lands that are cultivated, because every year the rain brings down the fat or good earth. It is frequently found on the banks of the river; but above all, it is found at the foot of hills where vines are planted, and of all cultivated lands which have much slope. In digging trenches and cellars for building, it generally happens, that what comes out of them is fit for the purpose.

CHAPTER IX.

On the Mixture of Earths.

As it may sometimes happen that earth of a proper quality is not to be found on the spot where it is intended to build, it becomes of importance to attend to the method of mixing earths; for though the earth, which is near at hand, may not of itself be proper, it is very probable that it may be rendered so, by the mixture of a small quantity of another earth, fetched from a distance. The principle on which a mixture must be made is very simple; strong earths must be tempered with light; those in which clay predominates, with others that are composed more of chalk and sand; and those of a rich, glutinous substance, with others of a poor and barren nature. The degree in which these qualities of the earths prevail, must determine the proportions of the mixture; which it is impossible here to point out for every particular case, but which may be learnt by a little practice. Some easy methods will be described in the next chapter, by which any one may make a trial of the qualities of his earth.

It will not be amiss to mix with the earth some small pebbles, gravel, rubbish of mortar, or in short any small mineral substances; but none of the animal or vegetable kind must be admitted.* Such hard substances bind the earth firmly between them, and being pressed and pressing in all directions, contribute very much to the solidity of the whole; so that well worked earth, in which there is a mixture of gravel, becomes so hard at the end of two years, that a chisel must be used to break it, as if it was freestone.

CHAPTER X.

Experiments to ascertain the Qualities of any Earth.

First Experiment.—Take a small wooden tub or pail, without a bottom, dig a hole in the ground of a court or garden, and at the bottom of that hole fix a piece of stone, flat and level; place your tub upon the stone, fill around it the earth that has been dug out to make the hole, and ram it well, that the tub may be inclosed, to prevent its bursting. Then ram into the tub the earth you mean to try; putting in, at each time, about the thickness of three or four fingers' breadths; when this is well rammed, add as much more, and ram it in the same manner, and so the third and fourth, &c. till the earth is raised above the brim. This superfluous earth must be scraped off extremely smooth, and rendered as even as the under part will be, which lies on the stone. Loosen with a spade the earth around the tub, and you will then be able to take it out, and with it the compressed earth that it contains; then turn the tub upside down, and if it is wider at the top than at the bottom, as such vessels usually are, the pisé will

* The pisé does not admit any vegetable or animal substances. In mud walls they put straw, chopped hay, hair flocks, wool, &c. to make the mud adhere to the wood, or laths; whereas the workmen who build in pisé are careful to pick out the least straw, or the smallest bit of root which remains in the earth: in short, the pisé is a mineral substance imitating stone, consequently any thing that can slake or rot must be excluded.

easily come out, but if it should happen to stick, let it dry in the air about twenty-four hours, and you will then find that the earth is loose enough to fall out of itself. You must be careful to cover this lump of pisé with a little board; for though a shower of rain, falling in an oblique direction, will not injure it, yet it may be a little damaged, if the rain falls perpendicular, and especially if it remains upon it. Leave the lump exposed to the air, only covered with a board or flat stone, and if it continues without cracking or crumbling, and increases daily in density and compactness as its natural moisture decreases, you may be sure that the earth is fit for building. But you must remember, that it is necessary that the earth employed should be taken from a little below the surface of the ground, in order that it may be neither too dry nor too wet: it must be observed also, that if the earth is not well pressed around the outside of the tub before it is filled, though the hoops were of iron, they would burst, so great is the pressure of the beaten earth against the mould, of whatever size it may be.

Second Experiment.—This trial may be made in the house. Having brought from a field the earth you want to try, press it in a stone mortar, with a pestle of wood, brass, or iron (the latter is best), or with a hammer, fill the mortar above the edge, and then with a large knife, or some other instrument, take away the superabundance of earth even with the brim. If you then find that the earth with not quit the mortar, you must expose it to the sun, or near a fire; and when it is sufficiently dry, it may be taken out without difficulty, by turning the mortar upside down on a flat stone, or on the floor. It will have the shape of the mortar, and if exposed as above directed, will shew the quality of the earth.

Third Experiment.—Press with the end of a stick or cane, your earth in a little box, round which you had better first tie a piece of packthread, lest it should burst in the operation; when you have filled it above its brim, cut off the overplus with a knife; you will undoubtedly be obliged to break the box to get it out, unless you had rather wait, and let it dry in the air, in the sun, or before a fire. It will take the exact form of the box, be it either round, square, or oval; if your earth be red, or any other colour, that which is inclosed in the box will still remain the same.

It is not improper to remark, that the colour of the earth neither adds to, nor diminishes, the goodness of the pisé, therefore every proprietor may be at ease on that head.

An Experiment which may be made at any time.—Every person in walking on his ground may make little balls of earth, and press them as tight as he can between his hands. If he brings them home and puts marks on them, he will by that means know the quality of every piece of land, and also be a judge of the mixture it will be necessary to make.

CHAPTER XI.

On the Preparation of the Earth for Building.

All the operations of this art are very simple and easy; there is nothing to be done but to dig up the earth with a pick-axe, break the clods with a shovel, so as to divide it well, and then lay it in a heap; which is very necessary, because as the labourers throw it on that heap, the lumps of earth and large stones roll to the bottom, where another man may break them or draw them away with a rake. I must observe, that there should be an interval of about an inch and

a quarter between the teeth of the rake, that the stones and pebbles of the size of a walnut, or something more, may escape, and that it may draw off only the largest. If the earth that has been dug has not the proper quality, which is seldom the case, and that it is necessary to fetch some better from a distance, then the mixture must be made in this manner: one man must throw one shovel full of the best sort, while the others throw five or six of the inferior sort on the heap, and so more or less according to the proportion which has been previously ascertained. No more earth should prepared than the men can work in one day, or a little more, that they may not be in want; but if rain is expected, you must have at hand, either planks, mats, or old cloths to lay over the heap of earth, so that the rain may not wet it; and then as soon as the rain is over, the men may resume their work, which, without this precaution, must be delayed; for it must be remembered, that the earth cannot be used when it is either too dry or too wet, and therefore if the rain should wet it after it has been prepared, the men will be obliged to wait till it has recovered its proper consistency; a delay which would be equally disadvantageous to them and their employer. When the earth has been soaked by rain, instead of suffering compression, it becomes mud in the mould; even though it be but a little too moist, it cannot be worked: it swells under the blows of the rammer, and a stroke in one place makes it rise in another. When this is the case, it is better to stop the work, for the men find so much difficulty that it is not worth while to proceed. But there is not the same necessity of discontinuing the work when the earth is too dry, for it is easy to give it the necessary degree of moisture; in such a case it should be sprinkled with a watering pot, and afterwards well mixed up together; it will then be fit for use.

It has already been observed, that no vegetable substances should be left in the earth; therefore in digging, as well as in laying the earth in a heap, great care must be taken to pick out every bit of root, great and small, all sprigs and herbs, all bits of hay and straw, chips or shavings of woods, and in general every thing that can rot, or suffer a change in the earth.

CHAPTER XII.

On the Bond Timber to be used in Buildings of Pisé.

To make good walls, it is not sufficient that the earth be well beaten, we must also learn to unite them well together. In houses of brick or stone, to consolidate their parts, they make use of angles and binders of freestone, and of iron braces, and cramp irons, which are very expensive; but here the binders cost very little; they consist only of thin pieces of wood, a few cramps and nails, and these are sufficient to give the greatest stability to buildings of pisé.

The first course A, see Plate LI. fig. 15, being laid on the front and inner walls of a house, we begin the second; and if for the inferior course the mould has been directed from A to E, it must, for this second, be directed from A to F, as has been explained, see Plate LIII. fig. 18. But before this second course is begun, lay at the bottom of the mould a board about five or six feet long, resting on the angle A, and extending lengthwise towards B. This board must be rough, as the sawyers have left it, something less than an inch thick, and in breadth about eight, nine, or ten inches, so that there may remain on each side four or five inches of earth, if the wall is eighteen thick: by this means the board will be entirely concealed in the body of the

wall. When thus placed neither the air, nor damp can reach it, and of course there is no danger of its rotting. This has been often proved by experience, as in taking down old houses of pisé such boards have always been found perfectly sound, and many that had not even lost the colour of new wood. It is easy to conceive how much this board, from the pressure of the work raised above it, will contribute to bind together the two lengths A and B, and to strengthen the angle A 1.: but this is not all, it is useful (particularly when the earth is not of a very good quality) to put ends of planks into the pisé after it has been rammed about half the height of the mould. These ends of planks should be only ten or eleven inches long, to leave as before a few inches of earth on each side of the wall, if it is eighteen inches thick; they should be laid crosswise (as the plank before mentioned is laid lengthwise) over the whole course, at the distance of about two feet from one another, and will serve to equalize the pressure of the upper parts of the works on the lower course of the pisé.

The boards abovementioned need only be placed at the angles of the exterior wall, and in those parts where the courses of the partition-walls join to those of the exterior wall; the same directions that have here been given for the second course must be observed at each succeeding course, up to the roof. By these means the reader will perceive that an innumerable quantity of holders or bindings will be formed, which sometimes draw to the right, sometimes to the left of the angles, and which powerfully unite the front walls with those of the partitions; the several parts deriving mutual support from one another, and the whole being rendered compact and solid.

Hence these houses made of earth alone, are able to resist the violence of the highest winds, storms, and tempests. The height that is intended to be given to each story being known, boards of three or four feet in length should be placed before hand in the pisé, in those places where the beams are to be fixed, and as soon as the mould no longer occupies that place, the beams may be laid on, though the pisé be fresh made; little slips of wood, or boards, may be introduced under them, in order to fix them level. The beams thus fixed for each story, the pisé may be continued as high as the place, on which you intend to erect the roof.

CHAPTER XIII.

On building Walls for Inclosures.

With respect to walls for inclosures of parks, gardens, yards, &c. the mould must be fixed in an angle, or against a building, if the wall is to reach so far, and the workmen must proceed from thence to the other extremity of the wall; and when they have finished the first course, they must raise the mould to make the second, returning to the place where they began the first.

But when a very great inclosure is to be made, as for instance, a park-wall, then, for the sake of speed, it is necessary to set several moulds and men to work. In such a case, a mould should be placed at each end, and the number of men be doubled; they will work at the same time, and meet in the middle of the wall, where they will close the first course; after which, each set of men raise their mould to make the second; and both setting out from the middle continue working, in opposite directions, towards the ends where they first began.

CHAPTER XIV.

On the Time and Labour necessary in building a certain Quantity of Pisé.

Besides the advantages of strength and cheapness, this method of building possesses that of speed in the execution. That the reader may know the time that is required for building a house, or an inclosure, he need only be told, that a mason used to the work, can, with the help of his labourer, when the earth lies near, build in one day, six feet square of the pisé. If two men can build in one day six feet square, it is evident that six men, which is the necessary number to work the mould (viz. three in the mould, and three to dig and prepare the earth), will build, in the course of sixteen days, or three weeks at most, such a house as is delineated in Plate LII. fig. 16 and 17, containing 288 square feet of wall: a very short time therefore is sufficient for a man to build himself a solid, and lasting habitation. These facts, which have been proved by numberless instances, afford a proportion by which every one may determine the time that his house or wall will take in building, having first ascertained the number of feet it will contain. Thus, if he wishes to have a wall 540 feet long, and six feet high, it will be finished in one month, with one single mould, and six men; but if he doubles both moulds and men, it will be done in fifteen days. These are simple but necessary instructions; for they will prevent the inconvenience to which many are exposed, from having the completion of their building protracted beyond the time that they originally expected. All persons who wish to build, may now contract with the builder that the work shall be finished on such a day; or that he shall indemnify them for all the losses which they may incur from his failure to made good his engagement.

CHAPTER XV.

On the outside Covering.

The outside covering of plaster, which is proper for pisé walls, is quite different from that which is made use of on any other walls; it is necessary too, to take a proper time for laying it on.

If a house of pisé has been begun in February, and completed in April, the covering may be laid on in the autumn, that is to say, five or six months after it is finished; or if it is finished in the beginning of November (at which time the masons generally give over working) it may be laid on in the spring. In this interval the walls will be sufficiently dried; but it must not be imagined, that it is the drought or cold that extracts the moisture from an earthen wall; it is only the air, and particularly the north air, which is of itself sufficient, either in summer or winter, to dry a pisé wall thoroughly. If you happen to lay the plaster over them before the dampness is entirely gone, you must expect that the sweat of the walls will cast off the plaster.

To prepare the walls for plastering, indent them with the point of a hammer, or hatchet, without being afraid of spoiling the surface left by the mould; all those little dents must be made as close as possible to each other, and cut in, from top to bottom, so that every hole may have a little rest in the inferior part, which will serve to retain and support the plaster.

To do this, the masons must make a small scaffold in the holes which the joists of the mould have left (see those holes in Plate LIII and LIV. fig. 18 and 19). This scaffold may be made in

a few minutes; and when, with the assistance of it, they have indented the upper parts of the house, they must run a stiff brush over the indented surface, to remove all dust or loose earth. The walls thus prepared, they may lay on the plastering; but before the manner of doing this is described, it should be observed, that there are two kinds of plaster that may be used in the pisé; rough-cast, and stuccoing. Rough-cast consists of a small quantity of mortar, diluted with water in a tub, to which a trowel of pure lime is added, so as to make it about the thickness of cream. Stucco is nothing more than poor mortar, which the labourers make up in a clean place near the lime-pit, and carry it to the masons on the scaffold.

Such is the manner of preparing the coverings; let us now see the manner of employing them.

For rough-casting, one workman and his labourer are sufficient; the workman on the scaffold sprinkles with a brush the wall he has indented, swept, and prepared; after that he dips another brush, made of bits of reed, box, &c. into the tub which contains the rough-cast, and throws with this brush the rough-cast against the wall; when he has covered, with as much equality as possible, so much of the wall as is within his reach, he lowers his scaffold, and stops up the holes of the joists with stones, or old plaster, &c.; does as before, and continues lowering his scaffold in the same manner till he comes to the bottom of the house.

This rough-cast, which is attended with so little trouble and expence, is notwithstanding the best cover that can be made for pisé walls, and for all other constructions: it contributes to preserve the buildings, and though not beautiful, has the recommendation of being attainable by people in moderate circumstances. It is the peculiar advantage of these buildings, that all the materials they require are cheap, and all the workmanship simple and easy.

The process of stuccoing is very different; two workmen and two labourers are requisite, the two workmen being on the scaffold, and one of the labourers making up the mortar, while the other carries it with water, and serves the workmen. One of the workmen holds in his right hand a trowel, and in the other a brush, with which he sprinkles the wall, having before hand indented and swept it; after that, he lays on a few trowels-full of stucco, which he spreads as much as possible with the same trowel, and then he lays on more, and thus continues his work. The second workman has also in his left hand a brush, and in his right a small wood float; he sprinkles water over the mortar that his partner has spread, and rubs over that part he has wetted with his wood float.

The reader easily perceives the progress of this work; the first workman lays on the plaster, and advances gradually, the second follows and polishes; one labourer makes up the stucco, the other carries it, and serves the workmen. By this progress the smoothest, finest, and cheapest plastering is made.

At the same time that the plaster is laid on, it may also be whitened by the use of lime alone, which is also an object of economy, since it saves white lead, &c. For this purpose dilute lime in a tub of very clear water, and let a labourer take some of it in a pot, and carry it to the workmen, who must lay it on with a brush; this, as well as all other colours, adheres to the plaster, and never falls, although it is used with water only, without size or oil. This is to be attributed to the precaution of laying on the colour whilst the plaster is still wet; as it grows dry, it incorporates mineral colours with its own substance, and makes them last as long as itself. This is on the principles of fresco colouring or painting.

Lime is of very general utility; it is used in building, in plastering, and in white-washing; and it will appear from the chapter on painting, that for that purpose also, it may be employed with advantages. Those who intend to build, therefore, ought always to have a store of it by them, and it should be slacked a long time before it is used, to prevent crevices and blisters, which, without this precaution, will arise in the plaster, and give it so disagreeable an appearance, that it will be necessary to do the work over again. The reason of it is this, there will always remain in the lime some particles that have not been slacked in the pit; all the stones are not entirely reduced to lime in the kiln, and those stones will resist the action of the water for a time, and will burst from the plaster after it has been laid, leaving the crevices abovementioned. This inconvenience will not happen if the lime, after being slacked, is left to stand some time before it is used. Indeed it will not be amiss to let it lie by a whole year.

CHAPTER XVI.

On Painting in Fresco on the outside Covering.

That kind of painting which is known by the name of Fresco, is the most beautiful and cheapest of any, and it is that which the French author recommends for the decoration of pisé buildings. The most celebrated painters were very partial to it, and Rome furnishes many excellent models, which should engage us to restore it from that neglect and disuse into which it has, without reason, been suffered to fall.

Whoever wishes to have his house painted in fresco, must have a painter ready, and place him on the scaffold with the workmen. The latter lay on the mortar, as before directed, and are attentive to spread it very even, to receive the paint. When they have finished one part, they suspend their work, to give the painter time to do his; for if they continued working on, the painter, who cannot go on as fast as they, would find the mortar too dry, and the colours would not incorporate with it. It is absolutely necessary, that the plasterer's work should be subordinate to that of the painter; it is sometimes so arranged, that the latter works while the former are gone to their meals; and when in his turn he retires from work, he traces out the part that the plasterers are to cover during his absence, foreseeing how much he shall be able to paint in the course of the day. All these precautions are taken, to prevent the too speedy drying of the mortar, and to seize the proper time to lay on the colours while it is fresh. Although this work does not profess to teach the art of painting in fresco, it may perhaps be found to contain directions sufficient for the execution of it in an ordinary manner.

To make the colour, you mean to give to a country house, dilute in a large tub a sufficient quantity of lime which has been slacked a long time; you must also dilute in another tub or pot, some ochre, either yellow, red, or any other mineral colour you please, but always in very clear water; after which, pour a little of the colour into the large tub, and stir it about with a stick, so as to mix it well with the lime; take some of the colour on a brush, and try it on a board or wall, if it is too deep or too light, add fresh lime or colour from the tub, and by repeated trials you will bring it to the tint you wish to give the house. The colour being made for the body of the house, the frames of the doors and windows are next to be considered, and a new colour chosen, to distinguish them from the rest of the front. If the body of the house is

painted yellow, or of a pale red, the angles and frames may be white or blue; if it is grey, they may be yellow or deep red, and in all cases it will be a very easy matter to find the most suitable colours.

The plasterers are equal to painting the fronts of houses in a common way; but when builders or proprietors wish to have them decorated in a superior manner, they must call in a painter, whose business it is to do it.

These paintings in fresco are more lively and more brilliant than any other, because the colours are not deadened by size and oil, which do not enter into their composition; their effect is surprising, and that pleasure may be had at a little expence.

Note.—The plaster proper to serve as a ground for fresco painting or colouring, is made of one part lime, and three parts clean, sharp, washed sand; this sort of painting has lately been executed with great success at Woburn Abbey, and some other places. It is not very usual to slack the lime in England so long before it is wanted; but it is an excellent practice, especially if it be wood-burnt.

II. *On the Mode of Building in France, termed* Pisé; *being the Substance of a Letter from the Rev. Mr.* Jaucour, *an emigrant Clergyman now in London, to the Under Secretary of the Board of Agriculture; dated London, 14th June, 1797.*

Sir,

My having been an inhabitant for some time of the town of Montbrison, capital of the Forêts, enables me to give you some information concerning the mode of building houses with earth, &c.

The church was the most remarkable in this style of building; it is about eighty feet long, forty feet broad, and fifty feet high; the walls built *in pisé*, eighteen inches thick, and *crépé*, or rough-cast on the outside with lime and sand. Soon after my arrival, the church, by some accident was destroyed by fire, and remained unroofed for about a twelvemonth, exposed to rains and frost. As it was suspected that the walls had sustained much damage, either by fire or the inclemency of the season, and might fall down, it was determined to throw them down partially, and leave only the lower parts standing; but even this was not done without much difficulty, such was the firmness and hardness these walls had acquired, the church having stood above eighty years; and all the repairs required, were only to give it on the outside, every twelve or fifteen years, a new coating of rough-cast.

A house for a single family is generally finished in about a fortnight. The following is the method I have seen them practice.

The earth is pounded as much as possible, in order to crumble any stones therein; clay is added thereto in a small quantity, about one-eighth part. It is all beaten and mixed up together by repeated blows with a mallet about ten inches broad, and ten or fifteen inches long, and two inches thick. The earth being thus prepared, and slightly wetted, the foundation of the

house is dug for; this is laid with stone, and when it is about one foot high above the surface of the ground, planks are arranged on each side, which are filled with earth intended for the wall; this is called *pisé* in the dialect of that country. It is strongly beaten; and this method is continued successively all round the building. The walls have more or less thickness, according to the fancy of the owner; I have seen them of six and of eighteen inches thick. Some builders intersperse from space to space a thin layer of lime. If several stories are intended in such erections, they do not fail to place beams to support the floors before they build higher; the windows and doors are attended to in the same manner. Of such buildings I never saw any consisting of more than two stories at most; generally they have but one, besides the ground-floor. When the building is thus finished, it is left for some months to dry: then such as wish to make the building more solid and durable, give it a rough-cast coating on the outside with lime and sand. This is what I have observed during a residence of three years in the town of Montbrison. I should be happy if this detail should afford the slightest information to the generous nation which has received us with so much goodness. I am, &c.

JAUCOUR,
Rector of St. John's, La Rochelle.

III. *Account of a Cottage and Garden near Tadcaster, by* Thomas Bernard, *Esq.*

Two miles from Tadcaster, on the left hand side of the road to York, stands a beautiful little cottage, with a garden, that has long attracted the eye of the traveller. The slip of land is exactly a rood, inclosed by a cut quick hedge; and containing the cottage, fifteen apple-trees, one green gage, and three winesour plum-trees, two apricot-trees, several gooseberry and currant bushes, abundance of common vegetables, and three hives of bees; being all the apparent wealth of the possessor. The singular neatness and good order that marked every part of this little domain, and some circumstances respecting the owner, which had been mentioned to me by Dr. Burgh of York, made me anxious to obtain the history of the cottager and his family. In the end of May, 1797, I called there in my way from York; but found the house and the gate of the garden locked. In the road to Tadcaster, however, I met his wife, laden with a basket of provisions from the market; and engaged her to find her husband, who was at work about a mile off, and to send him to me at the inn at Tadcaster. When he arrived, he very willingly gave me his history, as follows:

General account of the cottage, &c.

His name is Britton Abbot; his age sixty-seven, and his wife's nearly the same. At nine years old he had gone to work with a farmer; and being a steady careful lad, and a good labourer, particularly in what is called task-work, he had managed so well, that before he was twenty-two years of age, he had accumulated near £40. He then married, and took a little farm at £30. a year; but before the end of the second year he found it prudent, or rather necessary, to quit it; having already exhausted, in his attempt to thrive upon it, almost all the little property that he had heaped together. He then fixed in

His history till the inclosure.

a cottage at Poppleton; where, with two acres of land, and his common right, he kept two cows. Here he had resided very comfortably, as a labourer, for nine years, and had six children living, and his wife preparing to lie in of a seventh, when an inclosure of Poppleton took place; and the arrangements, made in consequence of it, obliged him to seek for a new habitation, and other means of subsistence for his family.

He applied to Squire Fairfax, and told him that, if he would let him have a little bit of ground by the road-side, "he would shew him the *fashions* on it." After inquiry into his character, he obtained of Mr. Fairfax the ground he now occupies; and, with a little assistance from the neighbours, in the carriage of his materials, he built his present house; and planted the garden, and the hedge round it, which is a single row of quick, thirty-five years old, and without a flaw or defect. He says he cut it down six times successively when it was young. Mr. Fairfax was so much pleased with the progress of his work, and the extreme neatness of his place, that he told him he should be rent free. His answer deserves to be remembered: "Now, Sir, you have a pleasure in seeing "my cottage and garden neat: and why should not other squires have the same pleasure, in "seeing the cottages and gardens as nice about them. The poor would then be happy; "and would love them, and the place where they lived: but now every little nook of land is "to be let to the great farmers; and nothing left for the poor, but to go to the parish."

He builds his cottage and plants his garden.

He has had seven children; six of whom attained to the age of maturity; and five are now living, and thriving in the world. One is the wife of a carpenter at York; another occupies a little farm at Kelfield; a third is the wife of a labourer, who has built a cottage for himself at Tadcaster, and wants nothing (as the father observed) but a bit of ground for a garden. Britton Abbot says he now earns 12*s.* and sometimes 15*s.* and 18*s.* a week, by hoeing turnips by the piece, setting quick, and other task-work: "but to be sure (he added) *I have a grand character in all this country.*" He gets from his garden, annually, about forty bushels of potatoes, besides other vegetables; and his fruit is worth, in a good year, from £3. to £4. His wife occasionally goes out to work; she also spins at home, and takes care of his house and his garden. He says they have lived very happy together for forty-five years. To the account that I have given, it may be needless to add, that neither he, nor any part of his family, has ever had occasion to apply for parochial relief.

Account of his family, earnings, &c.

Though my visit was unexpected, and he, at the latter end of his Saturday's work, his clothes were neat and sufficiently clean: his countenance was healthy and open; he was a little lame in one leg, the consequence of exposure to wet and weather. He said he had always worked hard, and well; but he would not deny, but that he had loved a mug of good ale * when he could get it. When I told him my object in inquiring after him, that it was in order that other poor persons might have cottages and gardens as neat as his,

His appearance, health, &c. &c.

* I have since learnt, that some of his neighbours are more disposed to talk of his love of ale, than of his industry. Perhaps he may have drank a little more, on account of the great quantity of task-work that he has done. He has not, however, the appearance of one habituated to tippling. My visit to him was on a Saturday evening, a time when alehouses are not empty; he was then at hard work. His countenance shews that he has not prejudiced his own health by drinking; and his

and that he must tell me all his secret—how it was to be done; he seemed extremely pleased, and very much affected; he said, "nothing would make poor folks more happy, than finding "that great folks thought of them:" that he wished every poor man had as comfortable a home as his own; not but that he believed there might be a few thriftless fellows, who would not do good in it.

Proposal about a cow.

I asked him whether he had not had a cow. He said he had had one, and she had died; and, having no other place but the lane to keep his cow, he had not attempted to get another.—"Could you get land, if you had a cow?"—He thought he could.—"Supposing then (I added) a cow could be bought for £12.: and you could rent it on the "terms of paying down £3. 10s. immediately; and then £3. 10s. at the end of each year "during three years; and that the cow was to be yours at the end of the three years, if she "lived, and you paid your rent regularly:—Do you think such a bargain would answer for you?"—Yes, he said, he was sure it would very greatly; and there were few cottagers, to whom it would not be a very great advantage, especially where they had a family of children. I told him to inquire whether he could get a little land; and I would have some more talk with him about it, when I came down in August.

OBSERVATIONS.

General view of his history.

The history of Britton Abbot, appears to me to merit attention. At the time of the inclosure of Poppleton, when he had six young children living and his wife preparing to lie in of a seventh, his whole little system of economy and arrangement was at once destroyed: his house, his garden, his little field taken from him, and all his sources of wealth dried up. With less success in his application for the rood of land, the spot in which his industry was to be exerted, and (in justice to him it must be added) with less energy than he possesses, he might have gone with his family into a workhouse; and, from that hour, have become a burthen to the public, instead of being one of its most useful members. Observe for a moment the effects of his well directed industry. Without any parochial aid, he has raised six of his seven children, to a state of maturity; and has placed them out respectably and comfortably in the world. Five of them are now living, in the middle period of life; and he continues, at the age of sixty-seven, a good working labourer; happy in his own industry and good management; in the beauty and comfort of his cottage, and in the extreme fertility of his garden.

The cottager should be encouraged to thrive in his cottage.

Britton Abbot possesses a degree of energy and spirit that we must not expect to find in every cottager. If, however, the poor do not exert themselves, and have not so much forethought and management as might be wished, the fault is less in them, than in the system of our poor laws, and in the manner in which they are executed. Were they properly and universally encouraged to industry and economy, we should soon find

cottage, garden, wife, and children, all testify, that he has not injured his family by it. His wife spoke of him with much apparent pleasure; while she produced a leg of mutton, and other good things which she had been purchasing at market for the supply of their larder.—If it had been true that he was a drunkard, it would have shewn still more forcibly, how much the energy of the labourer is capable of, even under so great and *deplorable* a disadvantage.

thriving and happy cottagers in every part of the kingdom. Let only a * tenth of the money, now spent in workhouses, in what is usually called "*the relief of the poor*," be applied in assisting and encouraging them to thrive and be happy in their cottages, the poor's rate will be lessened, and a national saving made both in labour and food. The labourer is capable of more exertion, and is maintained for less than half the expence, in his cottage, than in a workhouse. In his cottage he has his family around him, he has something he can call his own, has objects to look forward to, and is the master of his own actions.—*Domestic connections*, *property*, *hope*, *liberty*, those master springs of human action, exist not in a workhouse.

Defects in our system of relief.

It is the misfortune of this country, that the well-disposed and industrious poor do not receive sufficient aid or encouragement. They find no distinction made between them and the idle and profligate; except this—*that the idle and profligate are to be maintained in part at their expence*. As the law is too frequently executed, the cottager, *tho poor himself*, is regularly assessed *for the relief of the poor*; but he receives no benefit from the fund, no assistance towards the support of himself and his family, unless he is reduced to absolute want, and presents himself hopeless at the door of the workhouse.

Increased by the act of Geo. I. as to workhouses.

This evil has been greatly increased by the ninth of Geo. I. which authorizes the farming of the poor, and refuses relief to those who will not submit to reside in the workhouse.† It is in consequence, the interest of the farmer of the workhouse, to keep it in such a condition, that (to use Mr. Parry's words) "the honest and industrious "labourer, who has brought up a large family with credit, and who, from misfortune "is poor, and from age past his labour, will submit to be half starved, rather than take up his "abode amidst such wretchedness and profligacy." By these means workhouses become objects of terror to the honest and industrious, and at the same time the favourite resort of the dissolute and abandoned; the dirt, the waste, the disorder, the want of regulation, and the ‡

* This experiment would be easily tried. Suppose the poor's rate of a parish so applied to be £600. a year; and that £60. a year of the rate, were to be annually employed in assisting the most industrious and deserving labourers, to become possessors of cottages and cows: I am confident the poor's rate of that parish would be greatly diminished in a few years; probably to half its present amount. The difference between a law that *encourages* the poor to exertion, and one that attempts to *compel* them to it, is, that in the first you have the co-operation of the millions of the people who are to be the objects of the law; in the second, all the labour is thrown on the unfortunate and unsuccessful persons who are to attempt to execute it.

† An act has been lately passed (in December, 1795), empowering the magistrates to order the cottager, under special circumstances, temporary relief at home. It has not, however, been attended to in some districts; and in others, the execution of it is very unwillingly submitted to by parish officers.

‡ An English workhouse is the only place upon earth, where the idle have the same allowance of food, and the same accommodation, as the industrious. In the table of diet of the Rasp-house at Rotterdam, there is a great difference made between those who do full work, and those who only work *half-task*. In the establishment at Munich, mere necessaries are allowed for those who do not work —for those who do, comforts and luxuries.

undistinguishing treatment of the worst and best characters, being as gratifying to them, as they are irksome and disgusting to the well disposed poor.

The situation of the cottager stated.

Let us consider what must be the effect of this system on the cottager.—Tenant to the farmer, who has taken his cottage over his head, he is aware that his new landlord will require as much rent as he can contrive to pay. He has a young and increasing family; and, when times are at the best, he often finds it as much as he can do to go on, from one day to another, in their support. He can hardly expect that, during the severity of the winter, the high price of bread, or the visitation of sickness, his earnings will always, and at all seasons, continue equal to the necessities of his family. If the hour of adversity arrives, he knows the rule of his parish, that "*no assistance is to be given to the labourer, "while he possesses any thing of his own;*" and that what, with much labour and much self-denial, he shall have saved, must all be exhausted and spent, before his claim to parochial relief can be admitted. It may be well to consider what incitement he has to thrift and forethought. Can we confidently answer for ourselves that, so circumstanced, we should act even as well, and look as much to futurity, as he does; or that we should not be made mere sensualists by despondency? Is it perfectly clear, that we should not spend every penny, that could be spared from the daily nourishment of our families, in self-indulgence at an alehouse?

Want of cottages for the poor.

Happy should I be, if I could make use of the history of Britton Abbot, to obtain for the labourer encouragement to imitate the energy of his industry. Of the different modes of aiding and animating the poor, none would have more tendency to raise them above the want of parochial aid, than that of enabling them progressively to follow his example, in such a manner, that the most deserving might in their turn become the owners of comfortable cottages and productive gardens; a measure which seems to be peculiarly called for by the present condition of the dwellings of the poor. It is a melancholy fact that, in* most parts of England, their habitations are not only comfortless and devoid of accommodation, but insufficient in number; and that honest and industrious families are frequently driven into the workhouse, merely for the want of cottages in their parish.

Benefit of giving them sites to build on.

If the custom of setting apart ground for them to build upon, were to obtain generally, and in a manner to induce and enable them to take the benefit of it, it would assist in gradually correcting this national and increasing evil, and in supplying that useful class of men with proper habitations.—It would have other very important effects. It would diminish the calls for parochial relief; it would encourage and improve the good habits of the poor; it would attach them to their parishes, and give them an increased

* There are some parts of England, particularly in the northern counties, where the habitations of the poor are very comfortable; and other parts, in which the public spirit and benevolence of individuals have done, and are doing much to improve them in their own neighbourhood. Picturesque cottages might be so disposed around a park, as to ornament and enliven the scenery with much more effect, than those misplaced Gothic castles, and those pigmy models of Grecian temples, that perverted taste is so busy with: but it is the unfortunate principle of ornamental buildings in England, that they should be *uninhabited* and *uninhabitable*.

interest and share in the property and prosperity of their country. The land required for each cottage and garden, need not be more than a rood; the value of which would bear no possible comparison to that of the industry to be employed upon it. The quarter of an acre, that Britton Abbot inclosed, was not worth a shilling a year. It now contains a good house and a garden, abounding in fruit, vegetables, and almost every thing that constitutes the wealth of the cottager. In such inclosures, the benefit to the country, and to the individuals of the parish, would far surpass any petty sacrifice of land to be required. FIVE UNSIGHTLY UNPROFITABLE ACRES OF WASTE GROUND WOULD AFFORD HABITATION AND COMFORT TO TWENTY SUCH FAMILIES AS BRITTON ABBOT'S.

In order to encourage the exertions of the labourer, I should hope that this would be conceded to me, that the rood of land, inclosed for his cottage and garden (on condition of a house being erected) be held in fee simple; and that, so long as a parishioner, labouring generally within his parish, continued owner and occupier, such cottage and garden should, by parliamentary authority, be exempt from rent,* taxes, rates, tithes, and all burthens whatsoever. It would be an important object to keep these little freeholds in the hands of the labourers of the parish; so that they might be transmitted from father to son, like those little estates, which we contemplate with so much pleasure in Burrodale. If, therefore, the exemption from † rent, taxes, &c. continued no longer than while the cottage was both the property and residence of a parishioner, generally working within his parish, it would not be of half as much value to any other person, as to him for whom it was originally intended; and if in some instances they got into other hands, they would soon return again into the possession of the labouring parishioner.

Exempt from rent and taxes, while the labourer is owner and occupant.

As the means of promoting industry and good conduct among the poor, I should hope that a preference would be given to "industrious parishioners, members of friendly so-"cieties;" and that the character of the man, the number of his children, and other circumstances, would induce the farmers to give him the carriage of his materials, and his other neighbours to help him ‡ with a pecuniary subscription. The annual

The kind of preference and aid to be given.

* The exemption from land tax, would create another exemption; that of not having to attend county elections. It might be proper that no settlement should be affected, or varied, by any ownership, or occupation, of these cottages: and that the performance of the condition, by the erection of the cottage, should be certified and recorded at the quarter sessions.

† The rent should not be less than a guinea a year; to be distributable in fuel among the poor of the parish at Christmas. This would serve at once as a penalty on the intruder, and as a compensation to the parishioners.

‡ When a young man in New England has saved a little money towards erecting his house, he applies to his townsmen for assistance: they fix the time, and all of them attend to get the building up. I have known one of those houses erected and covered in, in the course of a few days.—If the poor in England were properly encouraged to become the possessors of cottages and cows, it would soon be the endeavour of all unmarried people to lay up money for that purpose; and the habits of industry and economy acquired then in the pursuit of so desirable an object, would adhere to them through life: a

sum of £. 10 or 20 so collected in a parish, and impartially and publicly given as a premium to the most deserving labourer in that parish (either to assist him in erecting* his cottage, or to enable him to purchase his cow), would produce an incalculable effect on the good habits of the poor: and, while it rewarded merit, would stimulate others to follow the example.

It would have other important effects. It would greatly diminish parish rates; † for he, who possesses a freehold cottage and garden, or a cow, has seldom, if ever, occasion to apply for parochial relief. By attaching the cottager to his own parish, it would secure to the farmer a certain supply of labourers, and would equalize, and keep down, the price of labour, now much enhanced by the disposition to wander about, in quest of the highest wages and the easiest work; a disposition which has occasioned a considerable waste in the produce of national labour. But this would not be all. Freehold cottages and gardens do not only attach the owners to their country, but are also the surest pledges and securities for their conduct. The cottager, who has property, is habituated to set a higher value on himself and on his character, and seems to be of a superior race of men. Besides this, the addition, which these little freeholds might make to the industry, morals, and ‡ produce of a country, would be an object of consideration, in this respect; that the cottager, who has a garden and a little property of his own, has always before him *a pleasurable object of industry* for his leisure time; whereas he who has none, is driven to the alehouse by the same *unhappy necessity*, that impels idle young men to the gaming table—the want of occupation.

Its good effects as to other parishes, and to the public.

The outline of a plan for supplying the cottager with a cow, is submitted to the consideration of the public. Its object is to avoid the two inconveniences, that attend the loan of money to the cottager, to enable him to purchase the cow *as his own property*: the one, that if the cow dies, it involves the cottager in debt, almost amounting to ruin;

On supplying cottagers with cows:

comfort and support to themselves and their families, and a blessing to the public. See Mr. Morton Pitt's Address to the Landed Interest, p. 10.

* It appears to me that in the estimates made for cottages, the expence of them is, in general, put at more than they would cost the mere labourer. Something may be deducted for things done by himself, or family, at extra hours, or by some of his neighbours, particularly in carriage; something for materials purchased at an under price, and for favour, which workmen can and will shew the poor, in the price of work done. It seems to be a fact, that they can contrive to build cheaper than the higher classes of life. Of four cottages near Aylesbury, built about eighteen years ago with my permission on the waste, the cost was from £. 20 to £. 30 each, including the walls of the gardens. They are good habitable dwellings.

† Landlords and farmers, who wish their own poor's rates reduced, would do well to inquire into the amount of the poor's rates in those parishes, where labourers have gardens and cows. One annual rate of sixpence in the pound has proved fully adequate to the relief of the poor in such a parish. See the Earl of Winchilsea's letter on the advantages of cottagers renting land.

‡ Productive gardens to cottages would, by the increased consumption of vegetables, make a considerable saving in bread corn: the same observation may be applied to cottagers' cows. Of butter, eggs, and poultry, our markets might have a regular and cheap supply from cottagers.

the other, that if the cottager is inclined to knavery, he may sell the cow, and make off with the money. In the mode which I have proposed, the cottager has a gradually increasing interest in the cow, sufficient to make him anxious for her preservation; but not such as either to involve him deeply, in case of her death, or to give him a right of disposing of her.* Fifteen pounds would be enough, to constitute, in any parish, a perpetual fund, to supply *annually* the *premium* of a cow, for some industrious and well disposed labourer's family, as long as this aid could be of any applicable use.

I am presuming, that the land owner shall have been induced to attend so far to his own interest, as to supply the cottager, at a moderate rent, with the means of feeding his cow, wherever it can be done. It will depend on the circumstances of the country, whether this object is to be attained by annexing ground to the cottages, as has been done by the Earl of Winchilsea, the Earl of Beverley, Lord Brownlow, Sir John Rushout, Mr. Whitbread, and † others; or by giving the cottager, at a certain moderate rent, an adjistment for the cow, as Lord Brownlow, and Mr. Morton Pitt, have done; or by the landlord supplying him with pasture and a limited quantity of hay for his cow, at a certain annual rent, as Mr. Burdon has done at Castle Eden; or by making the keep of the cottager's cow, at a limited rent, one of the conditions on which the farmer takes his farm, a method that has been adopted in the county of Lincoln. There is hardly any part of England, however, in which the cottager's cow may not be provided for, by one or other of these means; or by another mode, which I should prefer, when practicable, as the right which it would give the poor man would be *unalienable;* and that is inclosing and improving from the waste, cow pastures of ten or twelve acres each; the exclusive benefit whereof the cottagers of the parish should enjoy at a small rent; which (after providing for fences, &c.) might go as a fund for

and the means of feeding them.

* Upon supposition that the price of the cow were £. 12, the donor of such a fund would have to advance £ 8. 10s. the first year, £. 5 the second, and £ 1. 10s. the third; after which the rent of £ 3. 10s. paid for three years, for each cow, would produce, in future, £ 10. 10s. a year; being (with the £ 3. 10s. originally paid by the cottager) £. 2 more than would purchase a cottager's cow every year after. The additional £. 2 a year would, I presume, be sufficient to insure, for the year, the landlord's interest in the cows.—I am not sanguine enough to hope, that every labourer can be so fortunate as to possess a cow, and a cottage and garden of his own; but there would be both benevolence and wisdom in making such a property attainable in all cases by industry and economy, and in holding them out to the Poor as the certain rewards of activity and good conduct.

† I have much pleasure in adding the name of the Duke of Northumberland. When a lease on his estates in Northumberland expires, he detaches from the farm from three to five acres each, for the labouring cottagers on it, and repairs their cottages, and then lets the residue of the land as a farm. Sir John Swinburne, I understand, is following his Grace's example.—Mr. Burdon's cottager's cow-pastures are closes of sixteen acres, for twelve cows each: he allows each cottager two loads of hay, making them in small stacks of four loads, so that one stack serves two cottagers; and he finds the system answer, both as to improvement of his ground, and amount of rent. I can only say that, when I was at Castle Eden, I thought his cottagers' hay stacks and cows the most pleasing ornaments of a very beautiful place.

supplying the poor of the parish with fuel. Such inclosures would be extremely gratifying, and beneficial to that useful class of men, the labouring poor. The stock on them should be limited; and a preference given to labourers working within the parish, in proportion to their families, their industry, and character.

Small farms benefit neither the farmer nor the public.

I have only to add, that my friend's history contains in it a strong proof, that, tho the cottager is benefited by the supply of a garden and of land for his cow, while he continues a labourer, yet if more land is added, just enough to constitute him *a little farmer*, with a very small capital, and to make him forego his profit and advantage as a labourer, his means of life, instead of being improved by the acquisition of land, are prejudiced. No persons earn a harder or more precarious living, or do less good with their land, than very small farmers. The condition of a labourer, who has a well-stocked garden, a couple of cows, a pig, and just ground enough to keep them, is affluence, compared with the lot of him, who attempts to live as a farmer, on a small quantity of ground, not sufficient to maintain him as a farmer, though abundantly adequate to its object, if divided among several labourers.

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